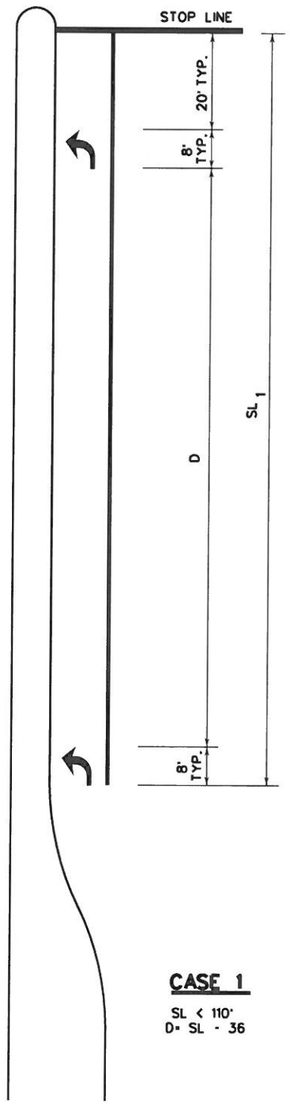
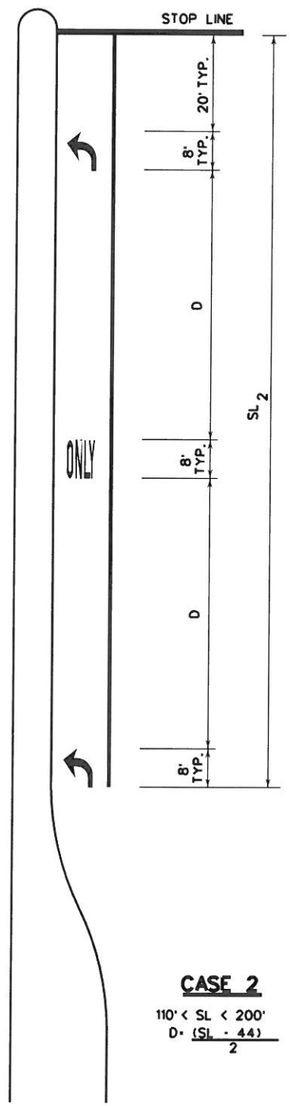


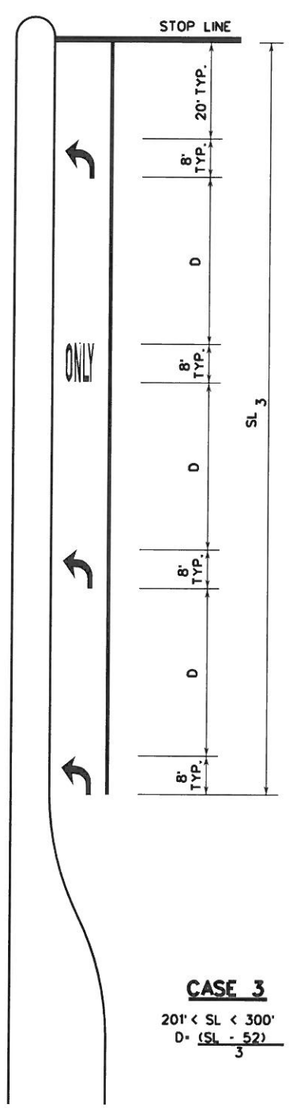

**CASE 1**

SL < 110'
D = SL - 36



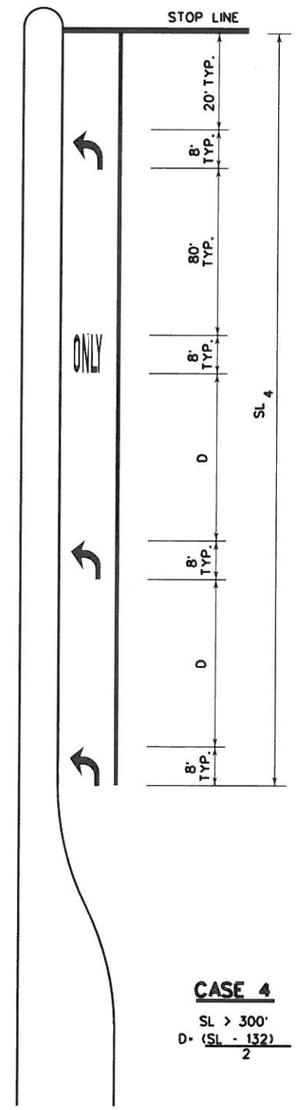

**CASE 2**

110' < SL < 200'
$D = \frac{(SL - 44)}{2}$




**CASE 3**

201' < SL < 300'
$D = \frac{(SL - 52)}{3}$




**CASE 4**

SL > 300'
$D = \frac{(SL - 132)}{2}$

KEY:

SL - STORAGE LENGTH (FEET)

D - DISTANCE BETWEEN ARROWS AND LEGENDS (FEET)

GENERAL NOTES:

1. THESE DETAILS ALSO APPLY TO RIGHT-TURN LANES.
2. FOR DUAL-TURN LANES, DIMENSIONS SHALL BE THE SAME FOR EACH LANE.
3. SL DIMENSION IS FROM STOP LINE TO END OF TURN LANE, WHICH DOES NOT INCLUDE TAPER LENGTH.
4. PAVEMENT ARROWS AND "ONLY" LEGEND MARKINGS ARE TYPICALLY USED AT SIGNALIZED INTERSECTIONS AND AT UNSIGNALIZED INTERSECTIONS WHERE A DEMONSTRATED NEED EXISTS.
5. MINIMUM SL = 110'. SL MAY BE LESS THAN 110 FEET AS DIRECTED BY THE CITY TRAFFIC ENGINEER.

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TRAFFIC ENGINEERING STANDARDS

# LEFT-TURN "ONLY" AND ARROW SPACING WORKSHEET

SHEET 1 OF 16

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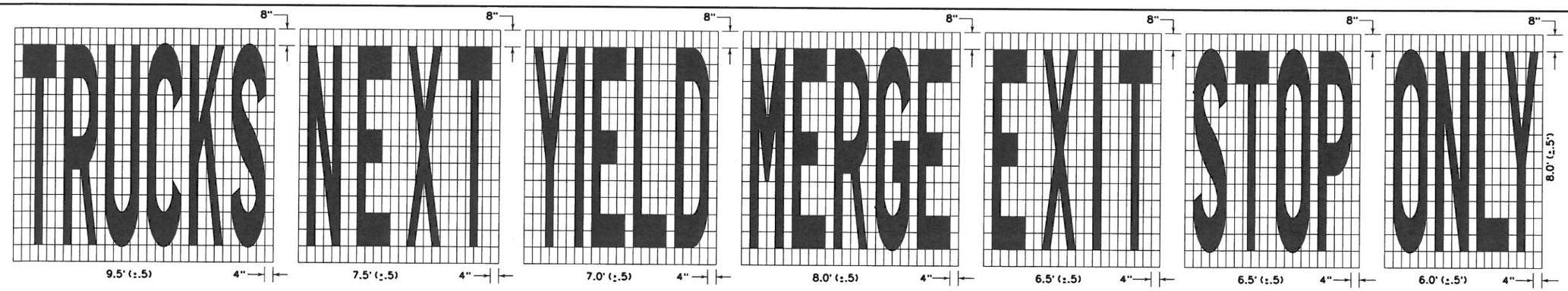
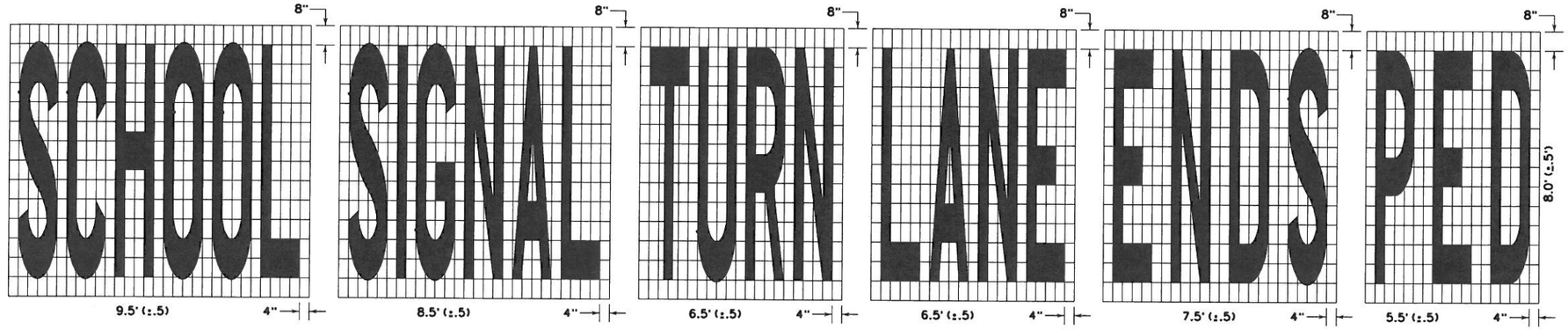
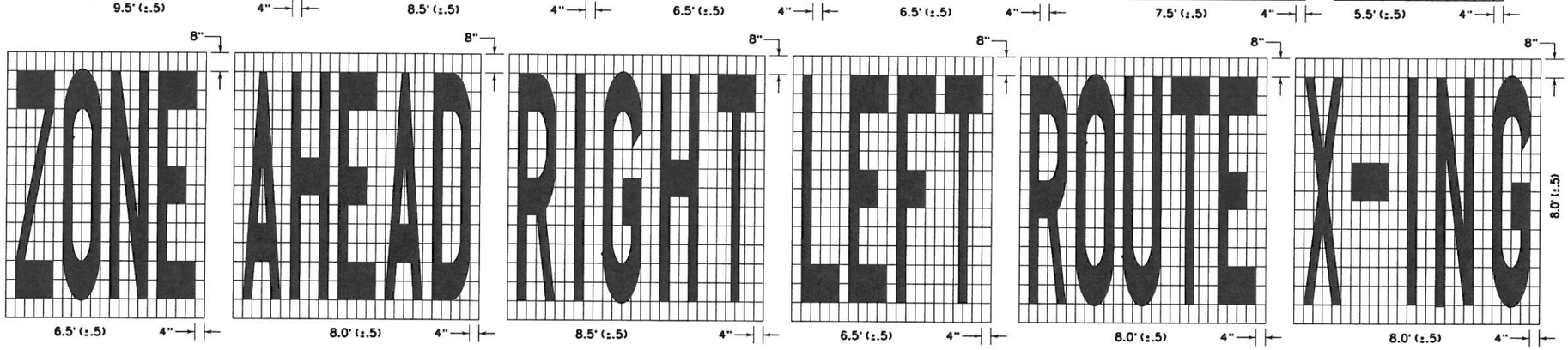
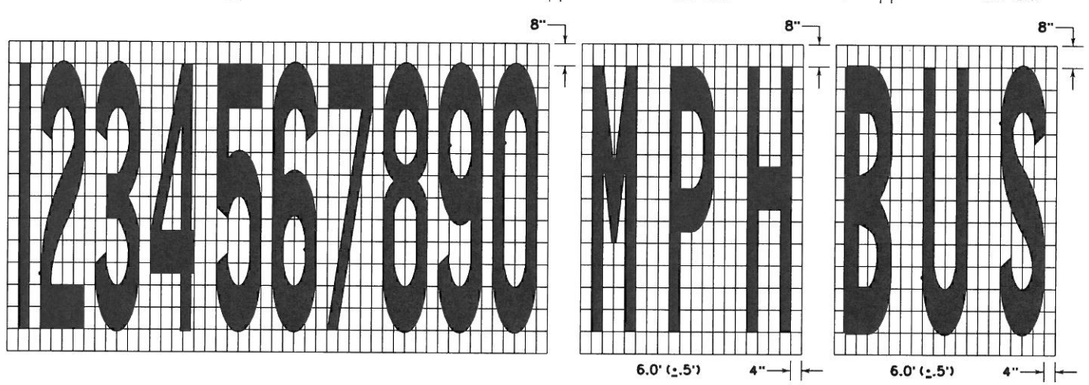
|---|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.R.V. | CHKD. BY: M.E. | SHEET NO.: ___OF___ |




SEPTEMBER 2009

CITY OF SAN ANTONIO
DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS
STANDARD PAVEMENT MARKINGS
(WORDS)
SHEET 2 OF 16

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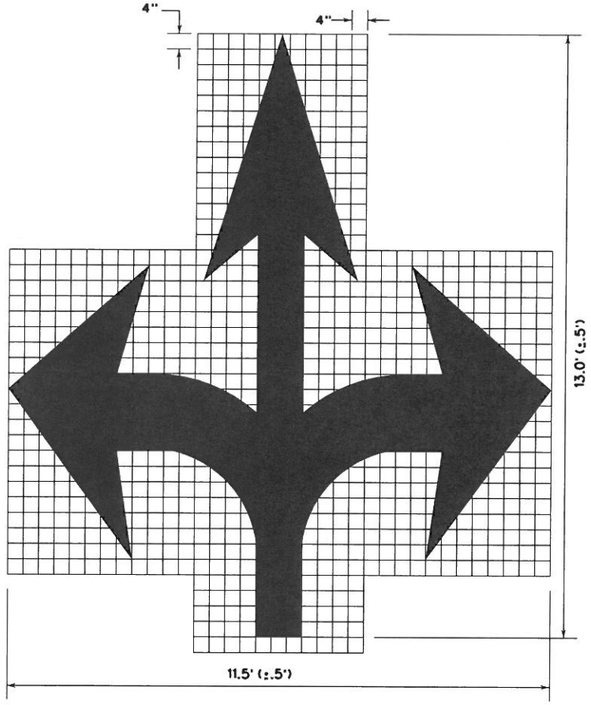
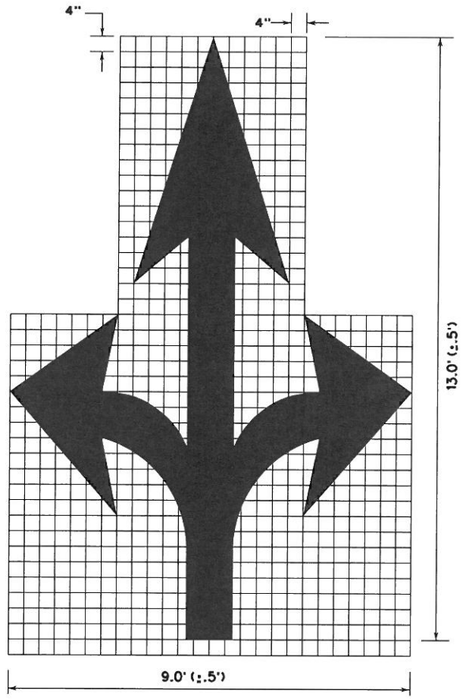
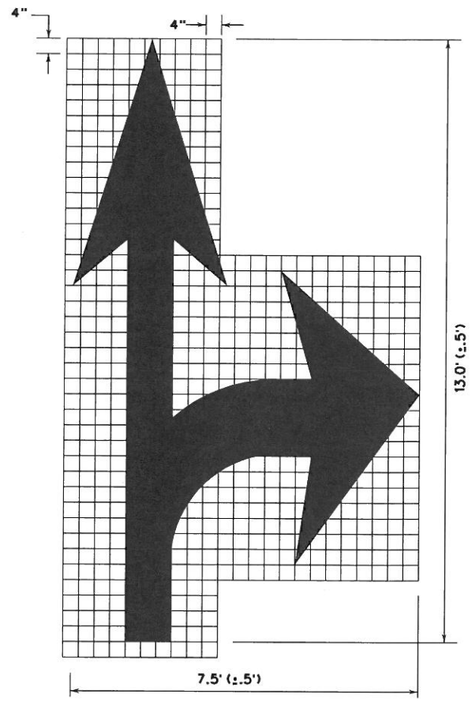
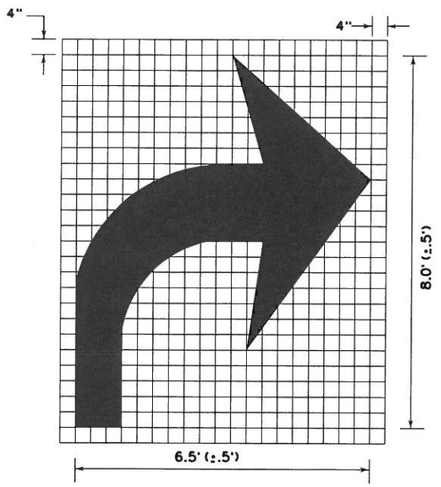
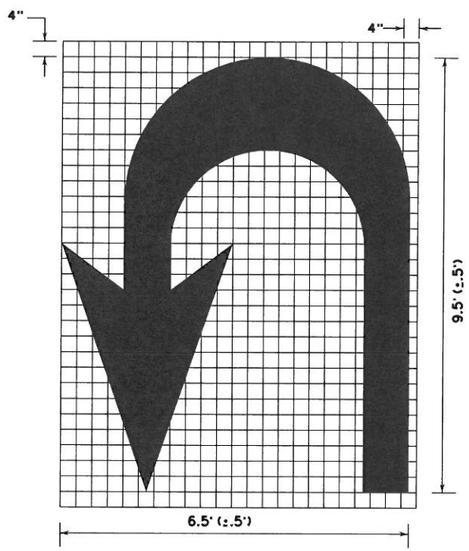
| % SUBMITTAL | PROJECT NO.: | DATE: |
|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.R.V. | CHKD. BY: M.E. | SHEET NO.: OF |

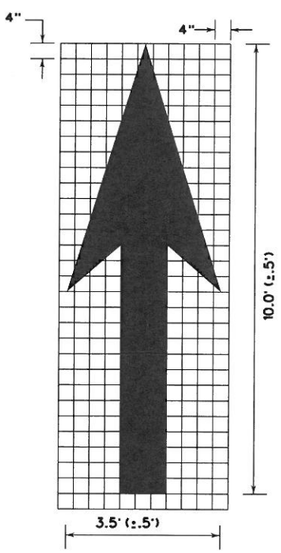


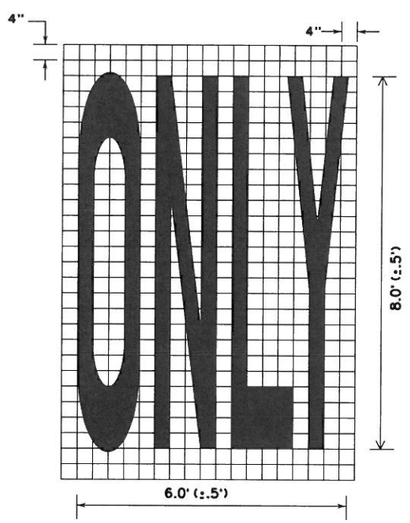




NOTES:

1. MINIMUM 8 FOOT WHITE MARKINGS SHALL BE USED, UNLESS OTHERWISE NOTED. IF MESSAGE CONSISTS OF MORE THAN ONE WORD, IT SHOULD BE PLACED WITH FIRST WORD NEAREST THE DRIVER.

2. THESE DETAILS ARE STANDARD SIZE FOR NORMAL INSTALLATION: SIZES MAY BE REDUCED APPROXIMATELY ONE-THIRD DEPENDING ON CONDITIONS.

3. THE LONGITUDINAL SPACE BETWEEN MARKINGS SHOULD BE 30 FEET.

4. MARKINGS CONSIDERED APPROPRIATE FOR USE WHEN WARRANTED INCLUDE THE FOLLOWING:

   A. REGULATORY
      STOP
      RIGHT (LEFT) TURN ONLY
      25 MPH
      SYMBOL ARROWS
   B. WARNING
      STOP AHEAD
      SIGNAL AHEAD
      SCHOOL
      SCHOOL X-ING
      PED X-ING
      R X R (SEE RCPM DETAIL)
      OTHER WORDS OR SYMBOLS MAY BE NECESSARY UNDER CERTAIN CONDITIONS

5. UNCONTROLLED USE OF PAVEMENT MARKINGS CAN RESULT IN DRIVER CONFUSION. WORD AND SYMBOL MARKINGS SHOULD BE NO MORE THAN THREE LINES.

6. THE WORD "STOP" SHALL NOT BE USED ON THE PAVEMENT UNLESS ACCOMPANIED BY A STOP LINE AND STOP SIGN. THE WORD "STOP" SHALL NOT BE PLACED ON THE PAVEMENT IN ADVANCE TO A STOP LINE, UNLESS EVERY VEHICLE IS REQUIRED TO STOP AT ALL TIMES.

7. PAVEMENT MARKINGS SHOULD GENERALLY BE NO MORE THAN ONE LANE IN WIDTH, WITH SCHOOL MESSAGES BEING THE EXCEPTION. FOR DETAILS OF SCHOOL AND SCHOOL CROSSING PAVEMENT MARKINGS, REFER TO PART VII OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

8. SPACING BETWEEN LETTERS SHOULD BE APPROXIMATELY 4 INCHES. THE WIDTH OF LETTERS MAY VARY DEPENDING ON THE WIDTH OF THE TRAVEL LANES.

9. LANE-USE ARROW MARKINGS MAY BE USED TO CONVEY EITHER GUIDANCE OR MANDATORY MESSAGES. ARROWS USED TO CONVEY A MANDATORY MOVEMENT MUST BE ACCOMPANIED BY STANDARD SIGNS AND THE PAVEMENT MARKING WORD "ONLY".

10. PAVEMENT MARKINGS ARE TO BE LOCATED AS SPECIFIED ELSEWHERE IN THE PLANS.

SEPTEMBER 2009

CITY OF SAN ANTONIO
DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS

# STANDARD PAVEMENT MARKINGS (ARROWS)

SHEET 3 OF 16

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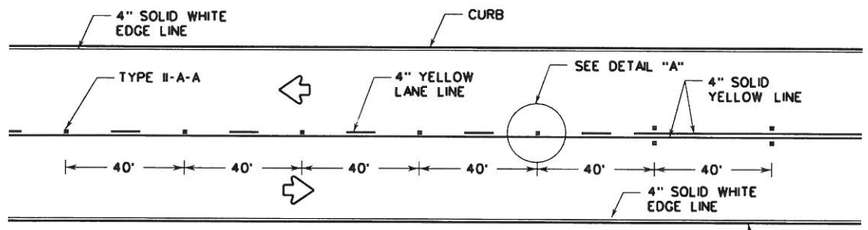
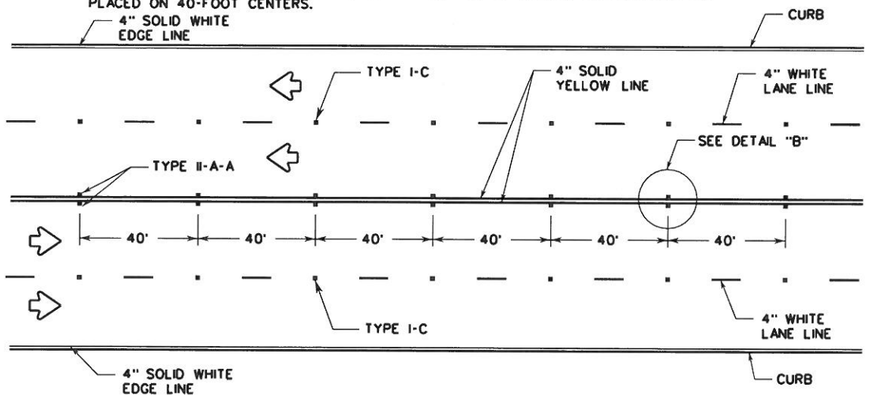
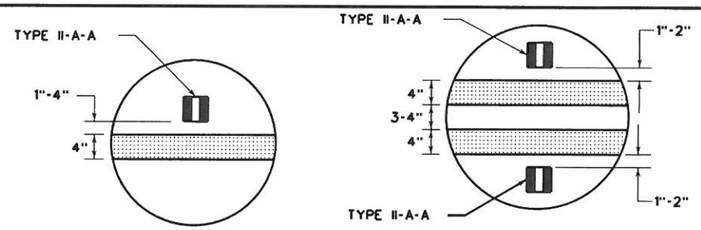
## CENTERLINE & EDGE FOR ALL TWO LANE STREETS WITH PASSING ZONE



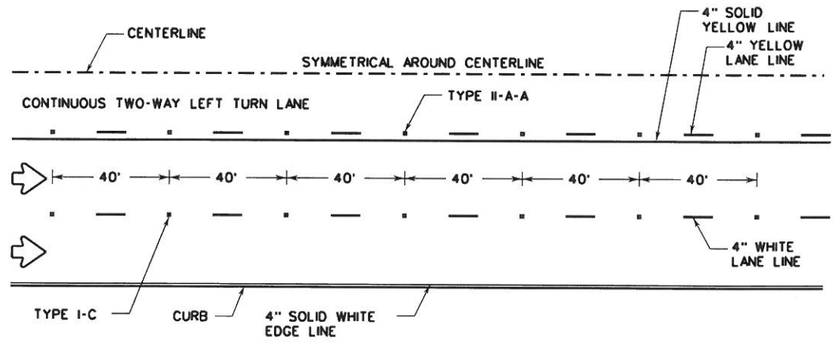

## CENTERLINE, LANE LINES & EDGE LINES FOR FOUR LANE TWO-WAY STREETS

RAISED PAVEMENT MARKER TYPE I-C, CLEAR FACE TOWARD NORMAL TRAFFIC, SHALL BE PLACED ON 40-FOOT CENTERS.



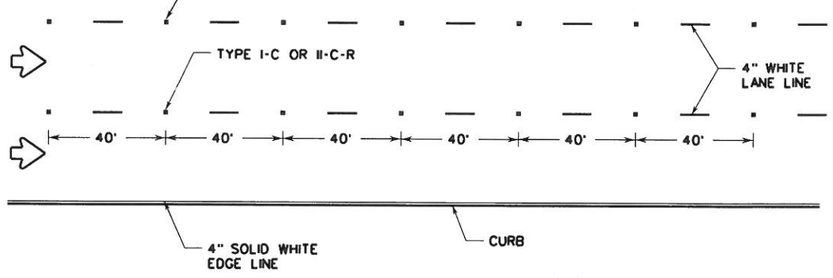




## CENTERLINE, LANE LINES, & EDGE LINES FOR TWO-WAY LEFT TURN LANE




## LANE LINES & EDGE LINES FOR ONE-WAY MULTILANE STREET

RAISED PAVEMENT MARKERS TYPE II-C-R SHALL HAVE CLEAR FACE TOWARD NORMAL TRAFFIC AND RED FACE TOWARD WRONG-WAY TRAFFIC.




## TABLE 1 - TYPICAL LENGTH (L)

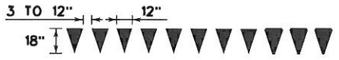
| * POSTED SPEED | FORMULA |
|---|---|
| 45> | $L = \frac{WS^2}{60}$ |
| ≥45 | L = WS |

* 85TH PERCENTILE SPEED MAY BE USED ON ROADS WHERE TRAFFIC SPEEDS NORMALLY EXCEED THE POSTED SPEED LIMIT. CROSSHATCHING LENGTH SHOULD BE ROUNDED UP TO NEAREST 5 FOOT INCREMENT.

L = LENGTH OF CROSSHATCHING (FT)
W = WIDTH OF OFFSET (FT)
S = POSTED SPEED (MPH)

EXAMPLES:
AN 8 FOOT SHOULDER IN ADVANCE OF A BRIDGE REDUCES TO 4 FEET ON A 70 MPH ROADWAY. THE LENGTH OF THE CROSS-HATCHING SHOULD BE:
$L = 8 \times 70 = 560$ FT
A 4 FOOT SHOULDER IN ADVANCE OF A BRIDGE REDUCES TO 2 FEET ON A 40 MPH ROADWAY. THE LENGTH OF THE CROSS-HATCHING SHOULD BE:
$L = 4(40)^2 / 60 = 106.67$ FT ROUNDED TO 110 FT

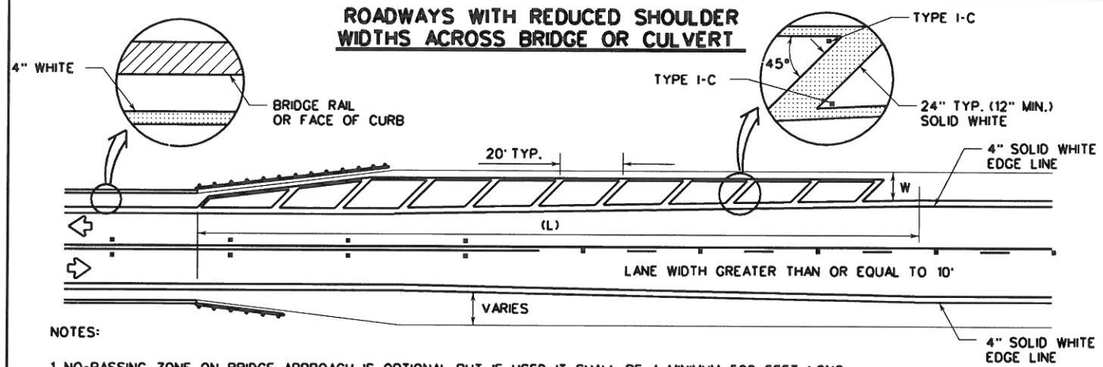
## YIELD LINES




GENERAL NOTES:

1. EDGELINE ADJACENT TO CURB AND GUTTER IS NOT REQUIRED IN ALL CASES, HOWEVER SHALL BE PLACED AS DIRECTED BY CITY TRAFFIC ENGINEER.
2. THE TRAVELED WAY INCLUDES ONLY THAT PORTION OF THE ROADWAY USED FOR VEHICULAR TRAVEL AND NOT THE PARKING LANES, SIDEWALKS, BERMS AND SHOULDERS. THE TRAVELED WAYS SHALL BE MEASURED FROM THE INSIDE OF EDGELINE TO INSIDE OF EDGELINE OF A TWO LANE ROADWAY.
3. ALL RAISED PAVEMENT MARKERS PLACED IN BROKEN LINES SHALL BE PLACED IN LINE WITH AND MIDWAY BETWEEN THE STRIPES.
4. ON CONCRETE PAVEMENTS THE RAISED PAVEMENT MARKERS SHOULD BE PLACED TO ONE SIDE OF THE LONGITUDINAL JOINTS.
5. ALL PAVEMENT MARKING MATERIAL SHALL MEET THE REQUIRED MATERIAL SPECIFICATIONS AS SPECIFIED BY CITY OF SAN ANTONIO STANDARD SPECIFICATIONS.
6. 4" SOLID WHITE EDGE LINES ARE OPTIONAL AS DIRECTED BY THE CITY TRAFFIC ENGINEER.

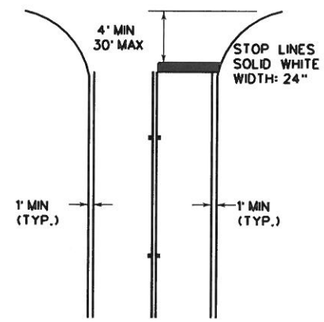
## ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT




NOTES:

1. NO-PASSING ZONE ON BRIDGE APPROACH IS OPTIONAL BUT IF USED, IT SHALL BE A MINIMUM 500 FEET LONG.
2. FOR CROSSHATCHING LENGTH (L) SEE TABLE 1.
3. THE WIDTH OF THE OFFSET (W) AND THE REQUIRED CROSSHATCHING WIDTH IS THE FULL SHOULDER WIDTH IN ADVANCE OF THE BRIDGE.
4. THE CROSSHATCHING SHOULD BE REQUIRED IF THE SHOULDER WIDTH IN ADVANCE OF THE BRIDGE IS 4 FOOT OR WIDER AND ANY REDUCTION IN SHOULDER WIDTH ACROSS THE BRIDGE OCCURS.

## GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE




SEPTEMBER 2009

CITY OF SAN ANTONIO
DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS

STANDARD PAVEMENT MARKINGS WITH REFLECTIVE RAISED PAVEMENT MARKERS FOR POSITION GUIDANCE 1

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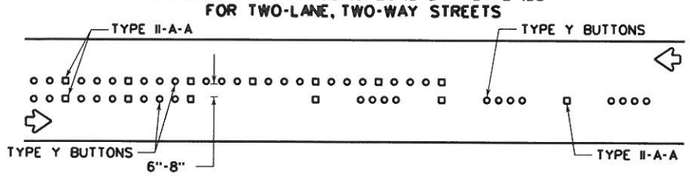
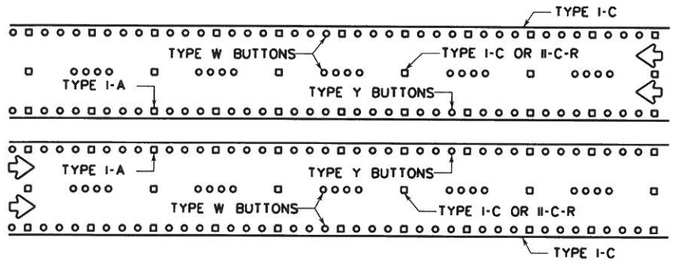
## RAISED PAVEMENT MARKING PLACEMENT PATTERNS

PLACED W/ REFLECTION PAVEMENT MARKERS (OPTIONAL)

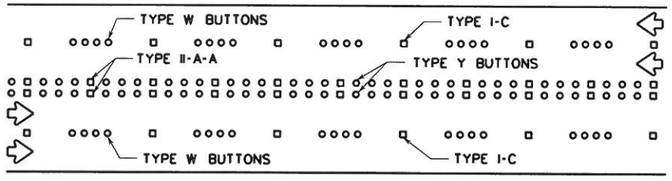
### CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY STREETS



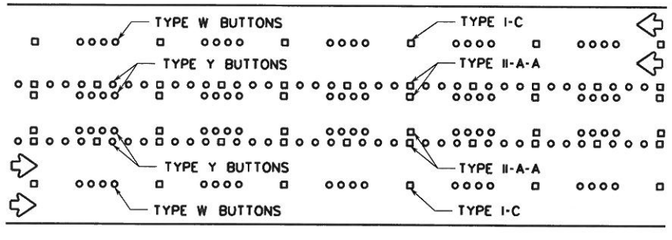

### EDGE & LANE LINES FOR DIVIDED STREET




### LANE & CENTER LINES FOR MULTILANE UNDIVIDED STREETS

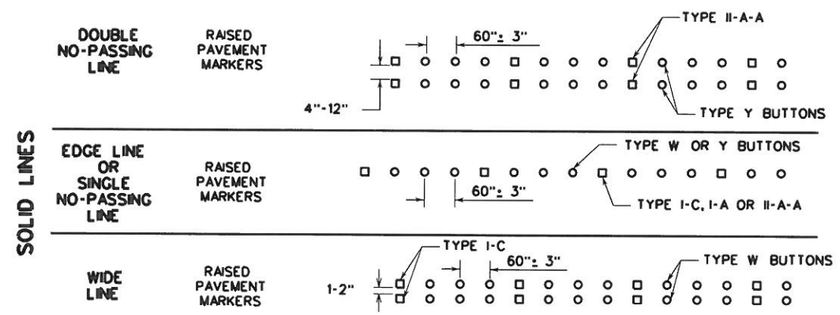



### TWO-WAY LEFT TURN LANE

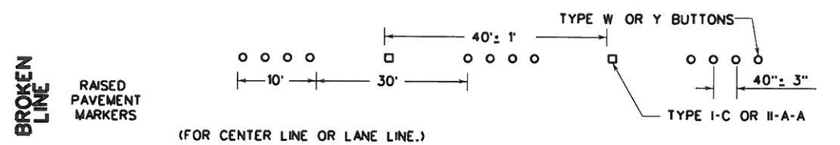



## RAISED PAVEMENT MARKINGS PLACEMENT DETAILS

PLACED W/ REFLECTION PAVEMENT MARKERS (OPTIONAL)




(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

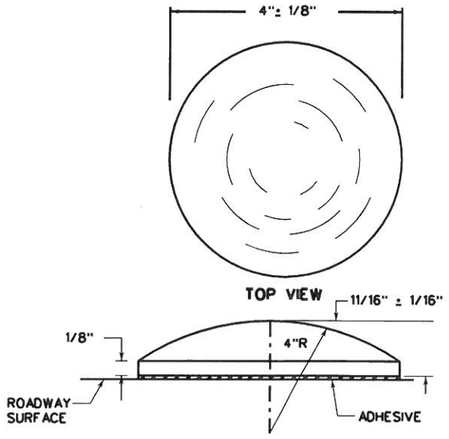



(FOR CENTER LINE OR LANE LINE.)

## TRAFFIC BUTTONS

(NON-REFLECTORIZED)

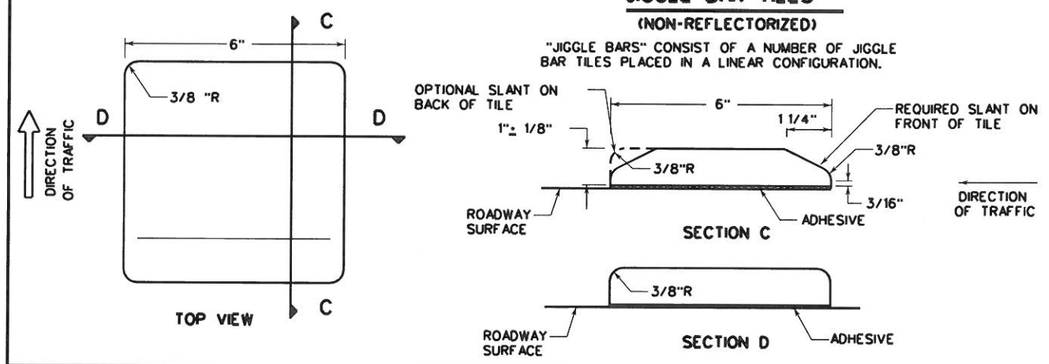
NOTE: MINIMUM AREA OF MARKERS SHALL BE NOT LESS THAN 12.5 SQUARE INCHES.




## JIGGLE BAR TILES

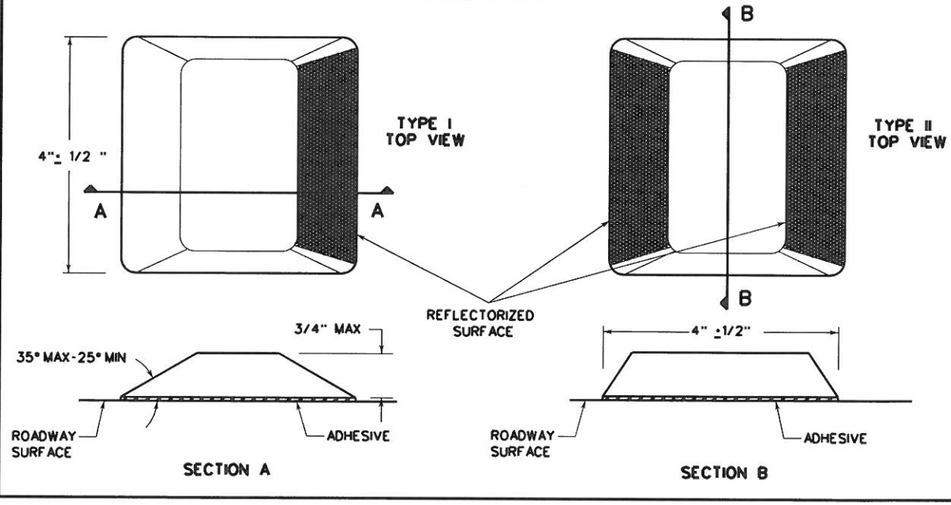
(NON-REFLECTORIZED)

"JIGGLE BARS" CONSIST OF A NUMBER OF JIGGLE BAR TILES PLACED IN A LINEAR CONFIGURATION.




## RAISED PAVEMENT MARKERS

(REFLECTORIZED)




NOTES:

1. RAISED PAVEMENT MARKERS (RPMs) MAY CONSIST OF TRAFFIC BUTTONS, PAVEMENT MARKERS AND/OR JIGGLE BAR TILES. PAVEMENT SURFACE SHALL BE PREPARED AND CLEANED SUBJECT TO APPROVAL OF THE CITY TRAFFIC ENGINEER BEFORE ADHESIVE AND RPMs ARE PLACED.
2. JIGGLE BARS SHALL BE ORIENTED PERPENDICULAR TO ROADWAY. JIGGLE BARS SHALL ALSO BE PLACED AT SUCH OTHER LOCATIONS AS SHOWN IN PLANS OR AS DIRECTED BY THE CITY TRAFFIC ENGINEER.
3. MARKERS, BUTTONS AND JIGGLE BAR TILES SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY AND NOT INTENDED TO SPECIFY ANY PARTICULAR PRODUCT. ALL PAVEMENT MARKERS PROVIDED SHALL BE OF THE SAME MANUFACTURER.
4. ALL DIMENSIONS ARE +/- 1/8" UNLESS OTHERWISE NOTED.
5. ALL PAVEMENT MARKING MATERIALS SHALL MEET MATERIAL SPECIFICATIONS AS SPECIFIED BY CITY OF SAN ANTONIO STANDARD SPECIFICATIONS.
6. TRAFFIC BUTTONS AND JIGGLE BAR TILES ARE TO BE USED ONLY FOR TEMPORARY TRAFFIC CONTROL OR AS DIRECTED BY THE CITY TRAFFIC ENGINEER.

SEPTEMBER 2009

CITY OF SAN ANTONIO

DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS

RAISED PAVEMENT MARKERS, REFLECTIVE PAVEMENT MARKERS, TRAFFIC BUTTONS & JIGGLE BAR TILES 2

SHEET 5 OF 16

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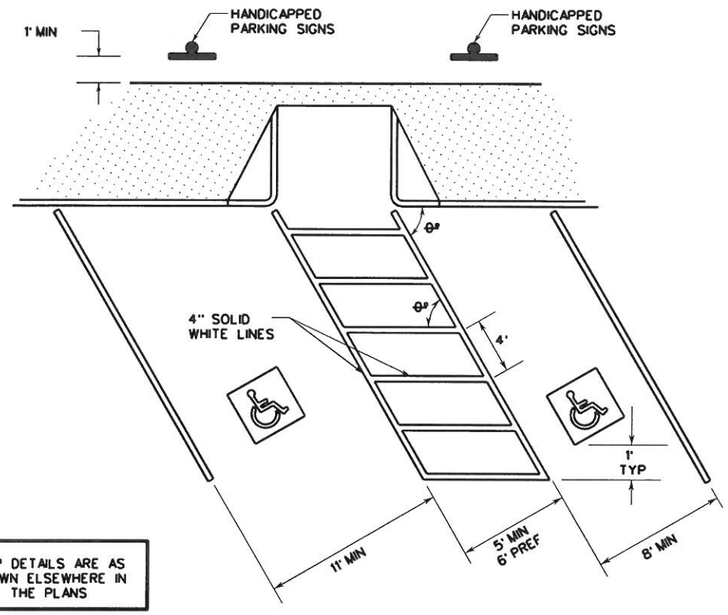
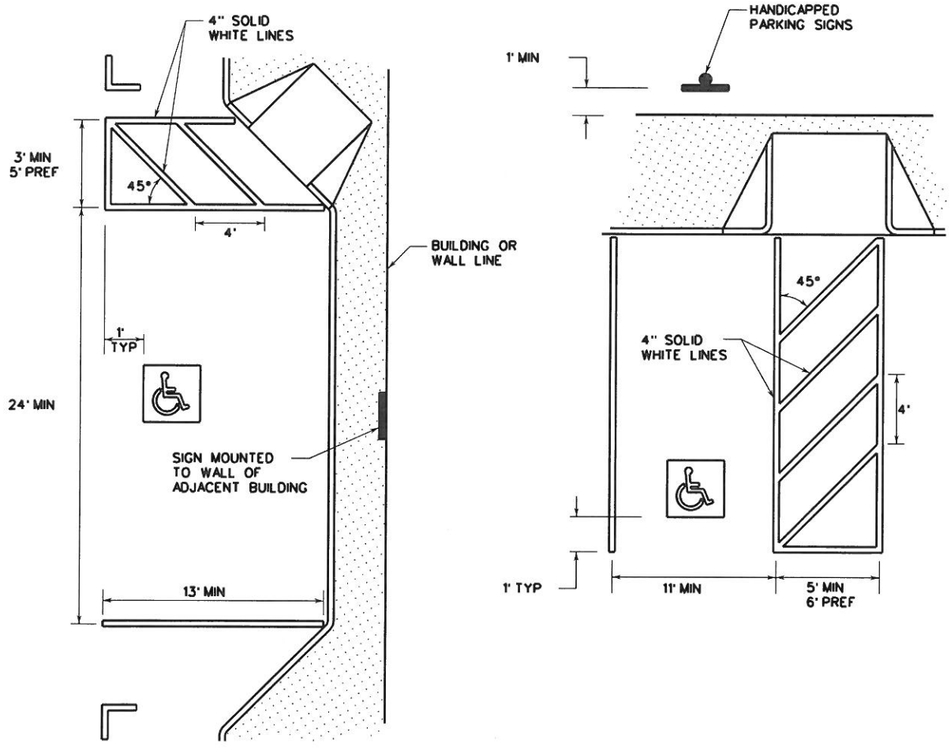
|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.R.V. | CHKD. BY: M.E. | SHEET NO.: OF |

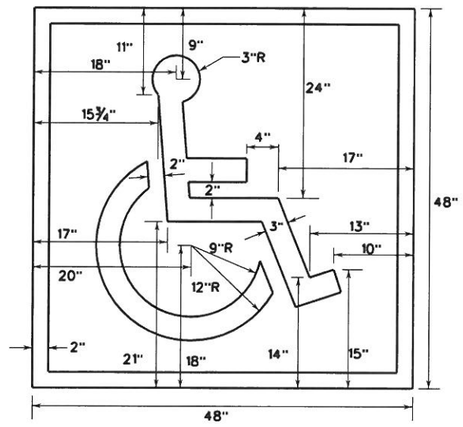
## TYPICAL ACCESSIBLE PARKING SPACE DIMENSIONS




RAMP DETAILS ARE AS SHOWN ELSEWHERE IN THE PLANS

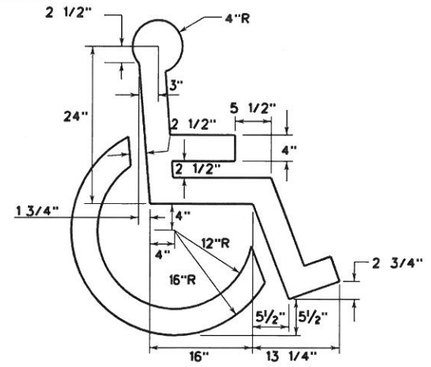



## PAVEMENT MARKINGS




WITH BACKGROUND

SYMBOL & BORDER: WHITE
BACKGROUND: BLUE




SYMBOL ONLY

SYMBOL: BLUE OR WHITE

NOTES:

1. ALL PARKING SPACE LIMIT LINES SHALL BE 4" SOLID WHITE LINES.
2. AISLE MARKINGS SHOWN ARE EXAMPLES ONLY. OTHER METHODS TO INDICATE A NO PARKING AREA ARE ACCEPTABLE. AISLE MARKINGS SHALL BE WHITE.
3. DIMENSIONS OF LIMIT LINES, AISLE MARKINGS, AND SYMBOL (WITH OR WITHOUT BACKGROUND) MAY VARY ± 10%.
4. PAVEMENT MARKING SYMBOLS (WITH BACKGROUND):
   A) ARE REQUIRED UNLESS STATED ELSEWHERE IN THE PLANS,
   B) SHOULD BE PLACED TOWARD THE FAR END OF THE PARKING SPACES SO AS TO BE VISIBLE TO MOTORISTS IN THE TRAVEL LANE,
   C) MAY BE PAINTED OR PREFABRICATED MATERIAL, AND
   D) SHALL BE 30"x30" MINIMUM.
5. WITH APPROVAL OF THE CITY TRAFFIC ENGINEER, PREFABRICATED PAVEMENT MARKING SYMBOLS WITH BACKGROUND OF OTHER DIMENSIONS EXCEEDING THE 30"x30" MINIMUM MAY BE USED. ALTERNATIVE DESIGNS SHALL INCLUDE A PROPORTION SIZED SYMBOL OF ACCESSIBILITY, AND SHALL CONFORM TO THE ILLUSTRATED COLORS FOR BACKGROUND, SYMBOL AND BORDER.
6. ALL SLOPE IN AND AROUND EXPECTED WHEEL CHAIR PATH SHALL NOT EXCEED 2% X-SLOPES.

SEPTEMBER 2009

CITY OF SAN ANTONIO
DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS

# PAVEMENT MARKINGS FOR ACCESSIBLE PARKING

SHEET 6 OF 16

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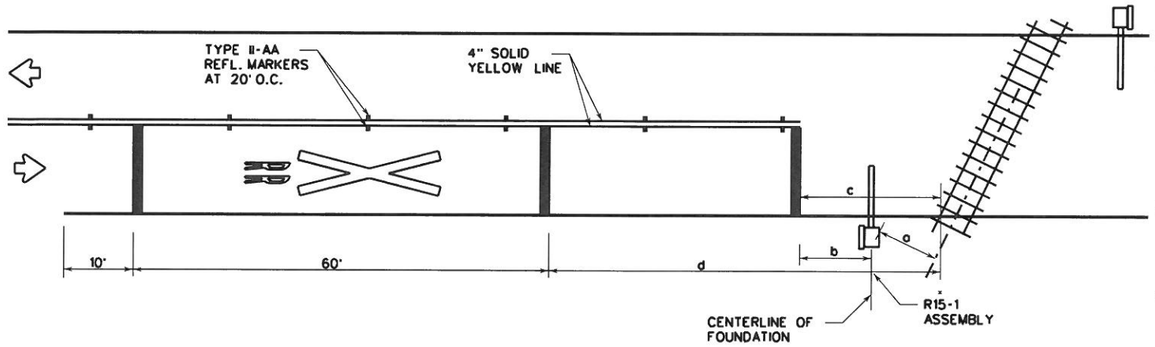
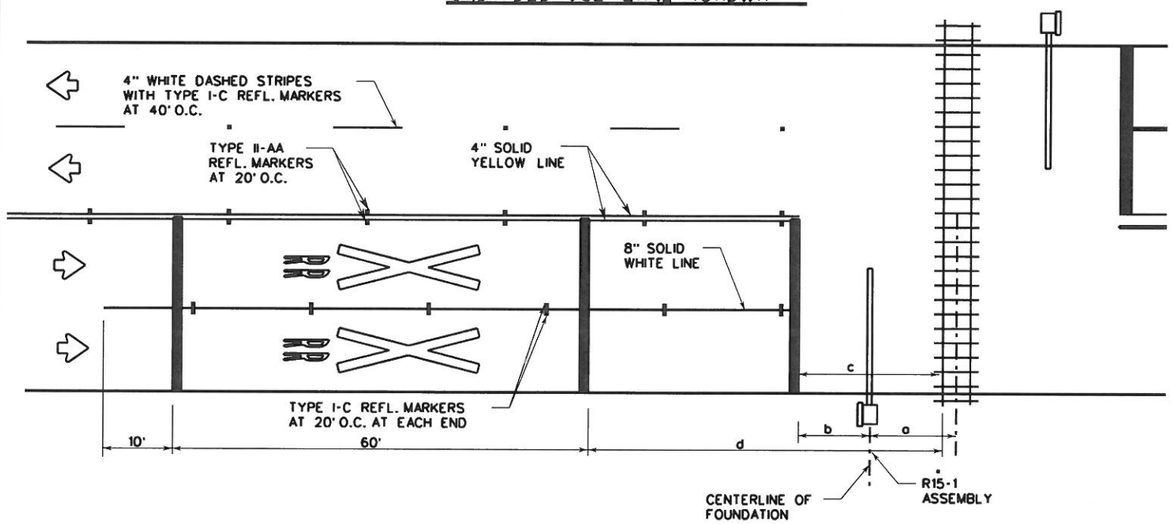
| % SUBMITTAL | PROJECT NO.: | DATE: |
|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.R.V. CHKD. BY: M.E. | SHEET NO.: OF |

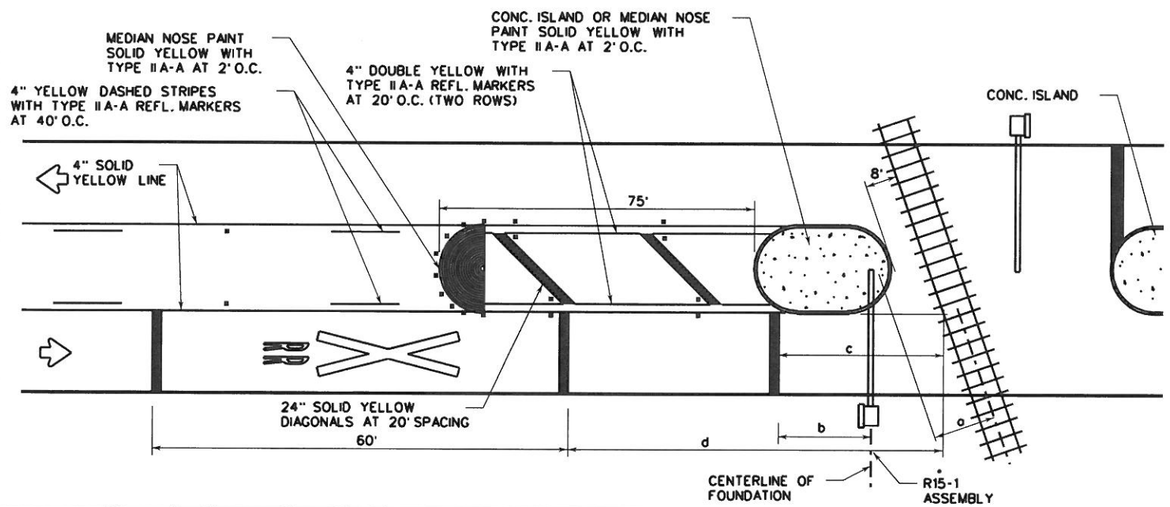
## TWO LANE, TWO-WAY




## UNDIVIDED MULTILANE ROADWAY




## TWO-WAY LEFT-TURN LANE (TWLTL)




a = 12 FEET MINIMUM, 15 FEET USUAL, IF ACTIVE WARNING DEVICES ARE PRESENT. DISTANCE "a" SHOULD BE MEASURED FROM THE CENTERLINE OF = R15-1 ASSEMBLY TO THE CENTERLINE OF NEAREST TRACK.

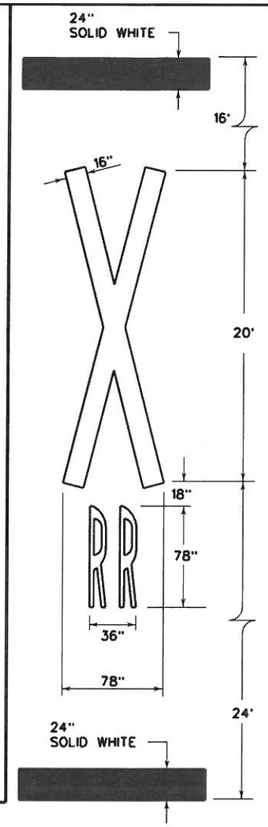
b= STOP LINES SHOULD BE APPROXIMATELY 8 FEET IN ADVANCE OF ACTIVE WARNING DEVICES (TYPE A, E OR F). STOP LINE SHOULD BE APPROXIMATELY 15 FEET FROM NEAR RAIL IF ONLY PASSIVE DEVICES (R15-1, PLUS R15-2 WHEN APPLICABLE) ARE PRESENT.

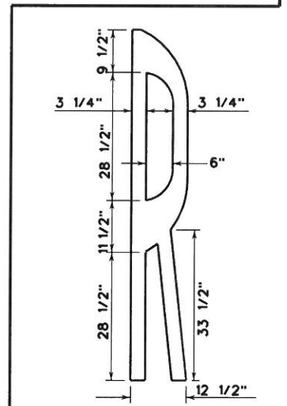
c= 15 FEET DESIRABLE MINIMUM IF NO GATE OR SIGNAL IS PRESENT. R15-1 SHOULD BE PLACED BETWEEN STOP LINE AND RAILS WITH ADEQUATE DISTANCE PROVIDED FOR "a".

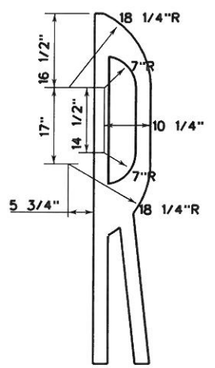
d*=

| APPROACH SPEED (MPH) | DESIRABLE PLACEMENT (FEET) |
|---|---|
| 20 | 145 |
| 25 | 220 |
| 30 | 295 |
| 35 | 370 |
| 40 | 445 |
| 45 | 520 |
| 50 | 595 |
| 55 | 670 |
| 60 | 745 |
| 65 | 820 |
| 70 | 900 |

* LOCAL CONDITIONS MAY REQUIRE ALTERNATE PLACEMENT LOCATIONS.




R15-1 ASSEMBLY

MAY CONSIST OF ONE OR MORE OF THE FOLLOWING:

R15-1 CROSSBUCK SIGN
R15-2 MULTIPLE TRACK SIGN
TYPE A MAST FLASHERS
TYPE E CANTILEVERS
TYPE F GATES

NOTES:

1. THE PAVEMENT MARKINGS ON AN APPROACH TO A RAILROAD GRADE CROSSING SHALL CONSISTS OF:
   A) THE RR X-ING SYMBOL,
   B) THREE TRANSVERSE 24" LINES, AND
   C) LANE LINES: A SOLID NO PASSING LINE FOR TWO-WAY TRAFFIC APPROACHES, OR SOLID LAND LINES FOR MULTILANE APPROACHES.
2. FOR BIDDING PURPOSES, THE RR X-ING SYMBOL WILL BE MEASURED AND PAID FOR AS FOR EACH LANE IN PLACE. THE TRANSVERSE MARKINGS AND LANE LINES WILL BE MEASURED AND PAID FOR BY THE LINEAL FOOT.
3. CENTERLINES SHALL BE YELLOW, OTHER MARKINGS SHALL BE WHITE.
4. APPROACH LANES LESS THAN 8 FOOT WIDTH SHALL NOT HAVE MARKINGS.
5. MARKINGS SHOULD NOT BE PLACED WHERE LESS THAN 110 FEET OF APPROACH ROADWAY IS AVAILABLE FOR PLACEMENT UNLESS DIRECTED BY CITY TRAFFIC ENGINEER.
6. RR X-ING SYMBOLS SHOULD BE PLACED APPROXIMATELY IN THE CENTER OF THE APPROACH LANE.
7. ALL TRANSVERSE MARKINGS, INCLUDING STOP LINES, SHALL BE PLACED AT RIGHT ANGLES TO THE CENTERLINE AND ACROSS ALL APPROACH LANES.
8. EXISTING NON-STANDARD MARKINGS SHALL BE REMOVED TO THE FULLEST EXTENT POSSIBLE SO AS NOT TO LEAVE A DISCERNABLE MARKING, BY ANY METHOD APPROVED BY THE CITY TRAFFIC ENGINEER. OVERPAINTING WILL NOT BE ALLOWED.
9. ADDITIONAL MARKINGS AND PLACEMENT DETAILS MAY BE FOUND IN THE TMUTCD, APPENDIX H.
10. THE CITY TRAFFIC ENGINEER MAY REQUIRE ADDITIONAL LONGITUDINAL MARKINGS IF THE DISTANCE BETWEEN THE STOP LINES IS GREATER THAN 80 FEET. MARKINGS ARE NOT REQUIRED ACROSS OR BETWEEN THE RAILS UNLESS SPECIFIED ELSEWHERE IN THE PLANS.

SEPTEMBER 2009

CITY OF SAN ANTONIO
DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS

# RAILROAD CROSSING PAVEMENT MARKING (RCPM) DETAILS

SHEET 7 OF 16

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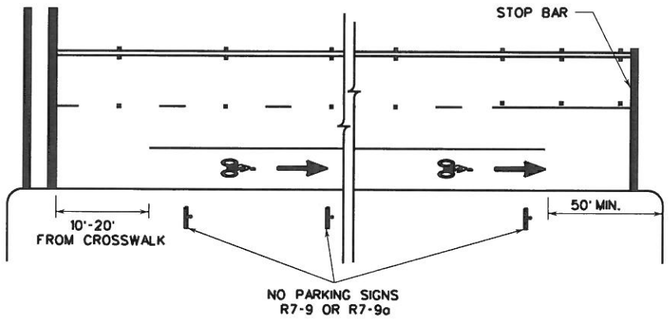
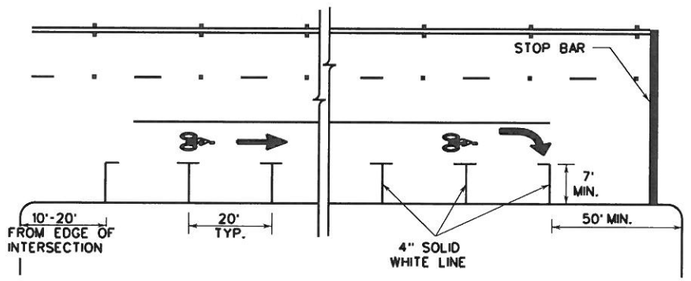
| % SUBMITTAL | PROJECT NO.: | | DATE: |
|---|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.R.V. | CHKD. BY: M.E. | SHEET NO.: OF |

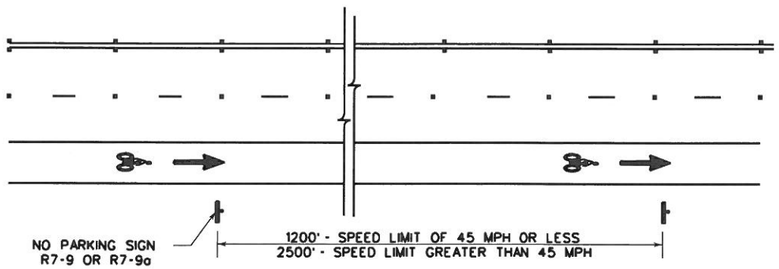
## NO PARKING ALONG BICYCLE LANE

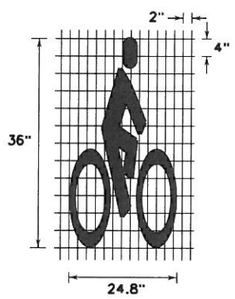


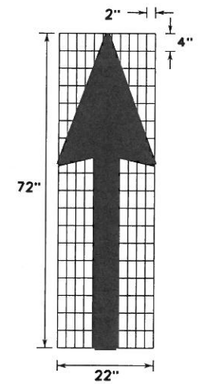

## PARKING ALONG BICYCLE LANE

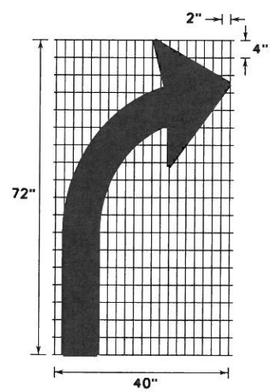



## ROADWAYS WITH FEW INTERSECTIONS

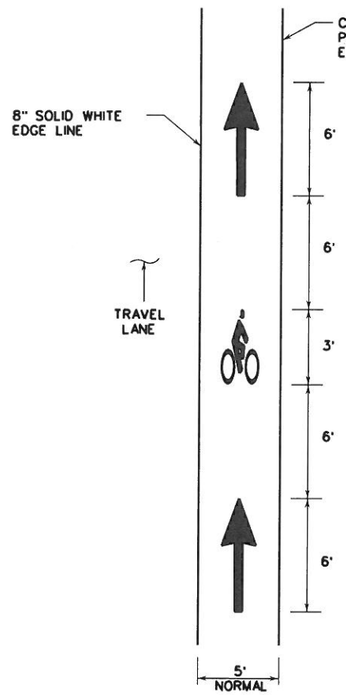


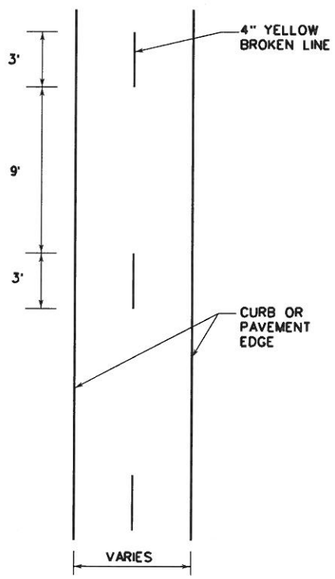




## ADJACENT TO TRAVEL LANE

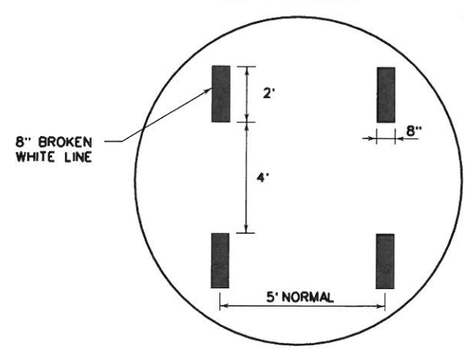



## SHARED USE PATH

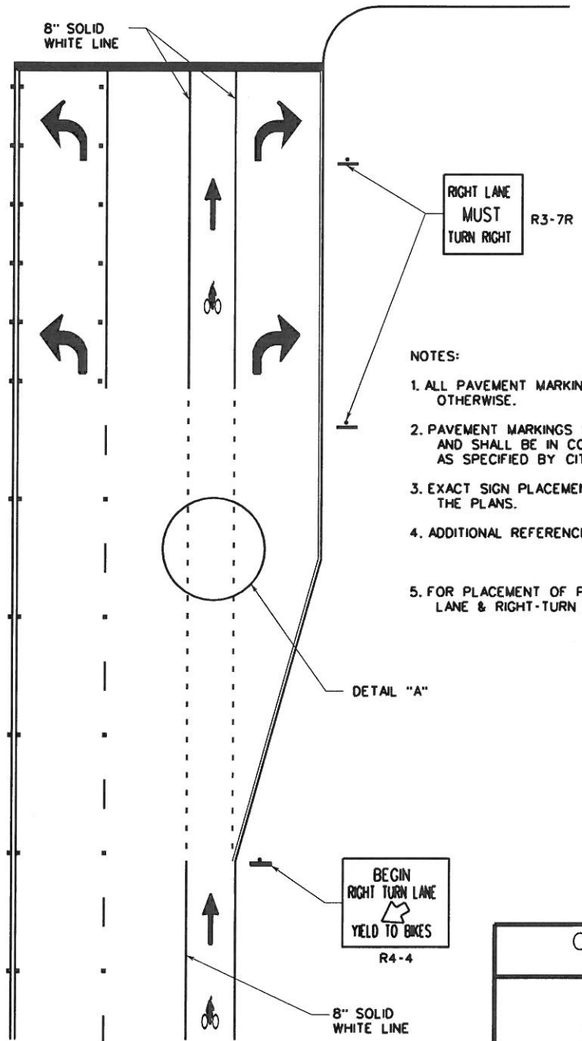
(SEPERATE FROM ROADWAY WITH NO MOTORIZED TRAFFIC)




## DETAIL "A"




## RIGHT-TURN LANE AT INTERSECTION




NOTES:

1. ALL PAVEMENT MARKINGS SHALL BE WHITE EXCEPT WHEN NOTED OTHERWISE.
2. PAVEMENT MARKINGS SHALL BE OF THE MATERIALS SPECIFIED AND SHALL BE IN CONFORMANCE WITH MATERIAL SPECIFICATIONS AS SPECIFIED BY CITY OF SAN ANTONIO STANDARD SPECIFICATIONS.
3. EXACT SIGN PLACEMENT AND DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.
4. ADDITIONAL REFERENCES: TMUTCD
   GUIDE FOR THE DEVELOPMENT OF BICYCLES FACILITIES, AASHTO, 1991.
5. FOR PLACEMENT OF PAVEMENT ARROWS AND WORDS SEE LEFT-TURN LANE & RIGHT-TURN LANE DESIGN WORKSHEET.

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CITY OF SAN ANTONIO

DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS

# BICYCLE LANE PAVEMENT MARKINGS

SHEET 8 OF 16

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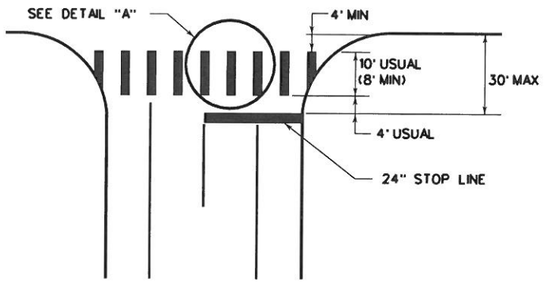
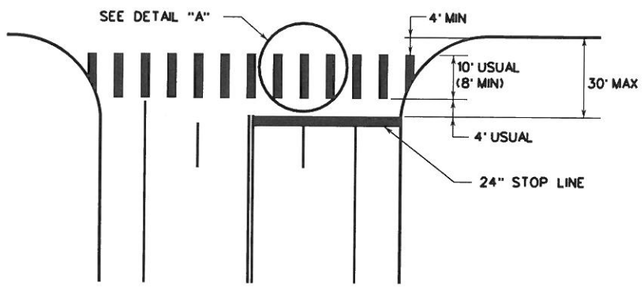
| % SUBMITTAL | PROJECT NO.: | | DATE: |
|---|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.R.V. | CHKD. BY: M.E. | SHEET NO.: OF |

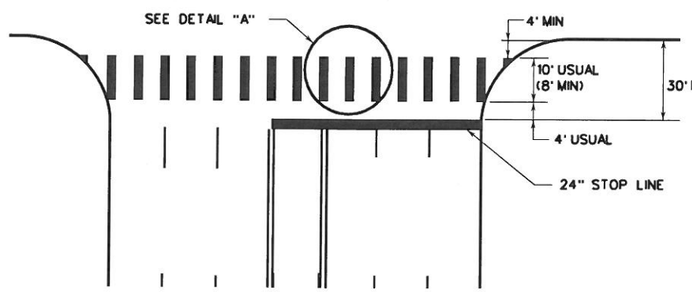
## TWO LANES WITH SHOULDERS



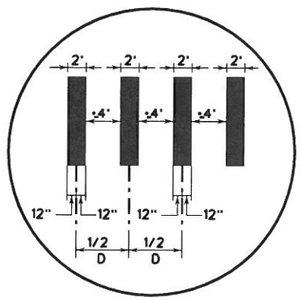

## FOUR LANES WITH SHOULDERS



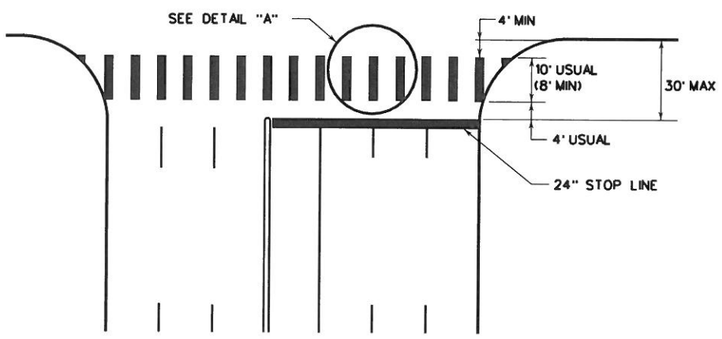

## MULTI - LANES



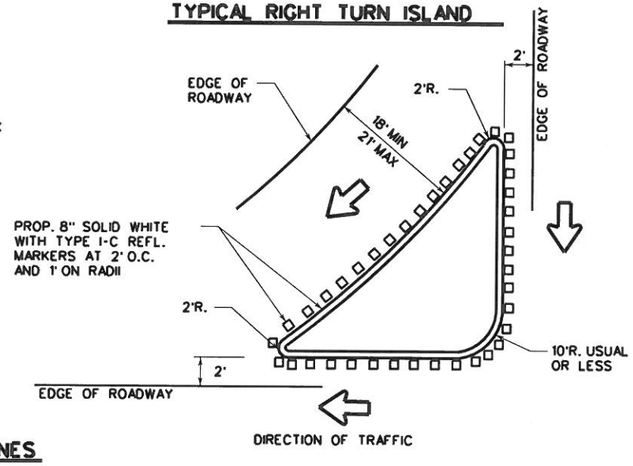

## DETAIL "A"



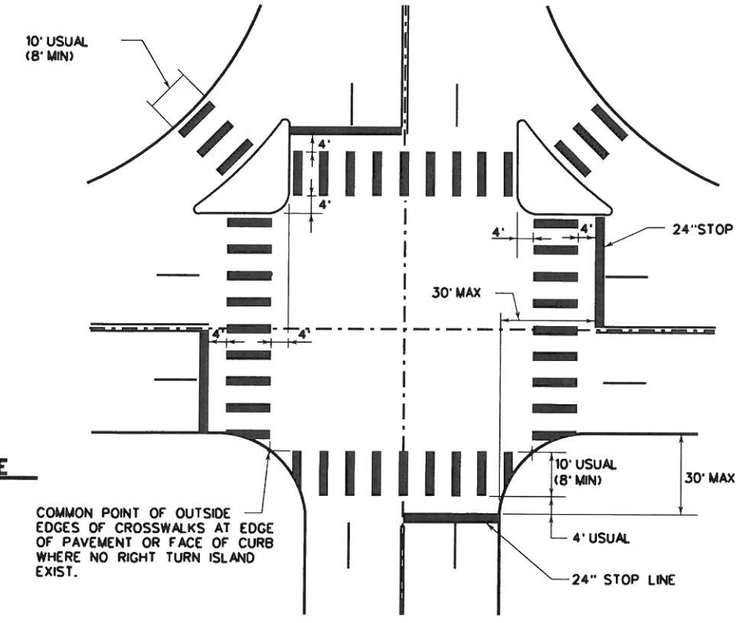

## MULTI - LANE WITH MEDIAN



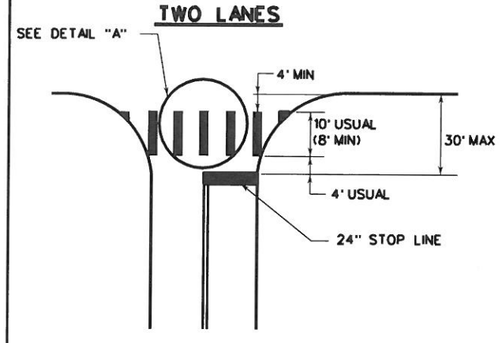

## TYPICAL RIGHT TURN ISLAND



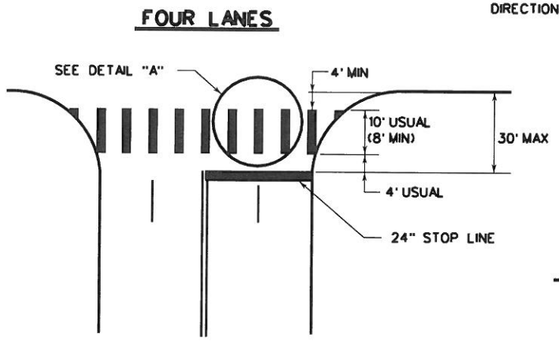

## INTERSECTION WITH RIGHT - TURN ISLANDS



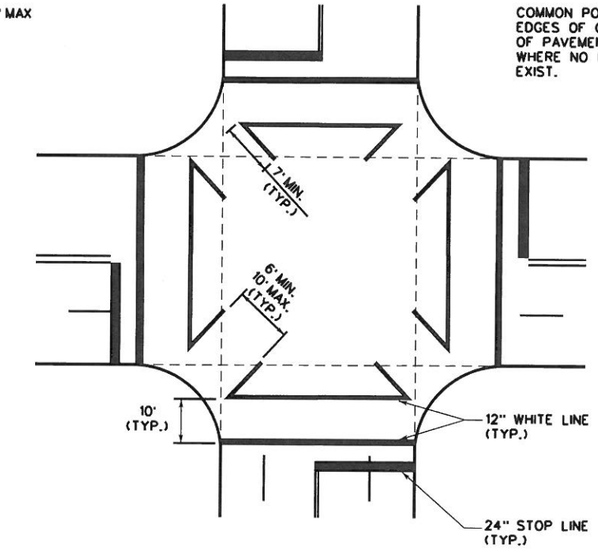

## TWO LANES



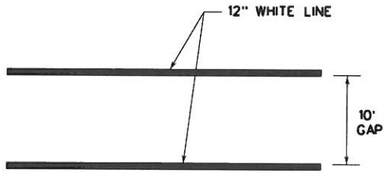

## FOUR LANES




## EXCLUSIVE PEDESTRIAN PHASE

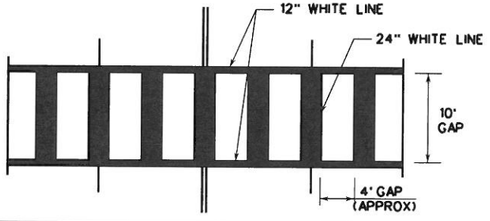



## CENTRAL BUSINESS DISTRICT CROSSWALK DETAIL




## HIGH VISIBILITY CROSSWALK DETAIL

TYPICALLY USED AT SIGNALIZED AND NON-SIGNALIZED MID-BLOCK CROSSINGS FOR COLLECTOR AND ARTERIAL ROADWAYS AND AT LOCATIONS REQUIRING EXTRA EMPHASIS.




NOTES:

1. CROSSWALKS AND STOP LINES SHALL BE WHITE.
2. "D" IS EQUAL TO ONE HALF THE WIDTH OF TRAVEL LANE.

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CITY OF SAN ANTONIO
DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS

# TYPICAL CROSSWALK DETAILS

SHEET 9 OF 16

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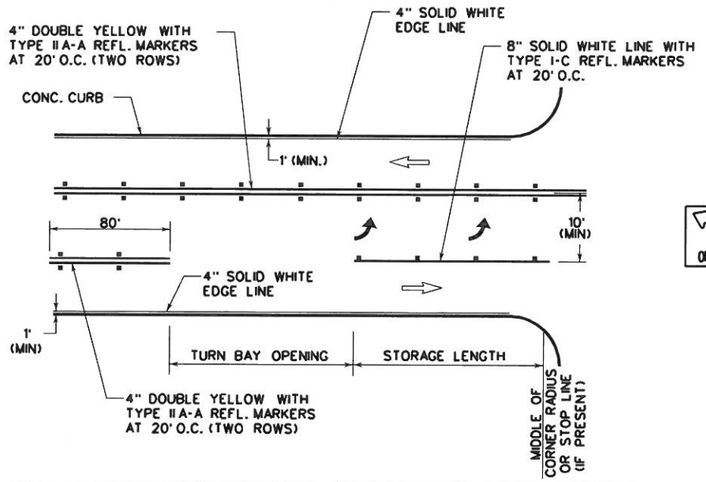
| % SUBMITTAL | PROJECT NO.: | DATE: |
|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.B.V. | CHK'D. BY: M.E. | SHEET NO.: OF |

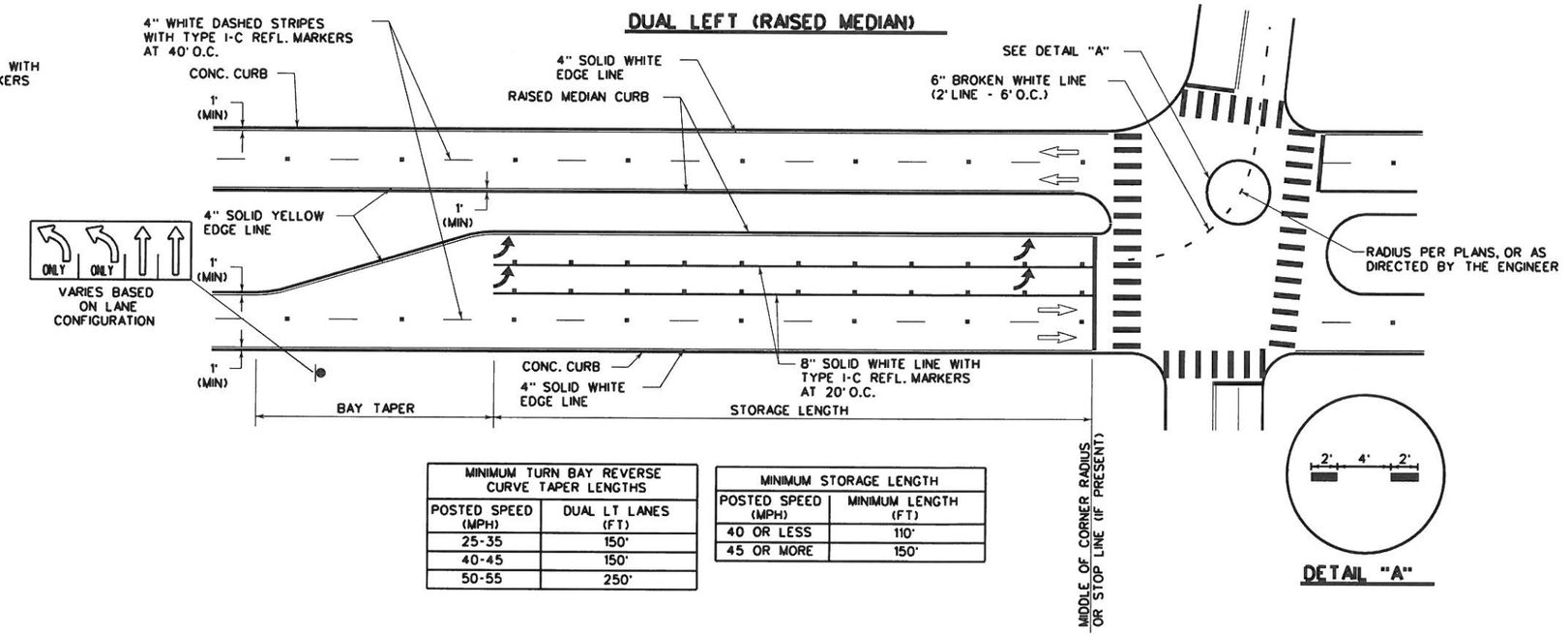
## LEFT-TURN LANE




| MINIMUM TURN BAY OPENINGS | |
|---|---|
| POSTED SPEED (MPH) | MINIMUM OPENING (FT) |
| 25-35 | 60' |
| ≥ 40 | 100' |

| MINIMUM STORAGE LENGTH | |
|---|---|
| POSTED SPEED (MPH) | MINIMUM OPENING (FT) |
| 40 OR LESS | 110' |
| 45 OR MORE | 150' |

## DUAL LEFT (RAISED MEDIAN)



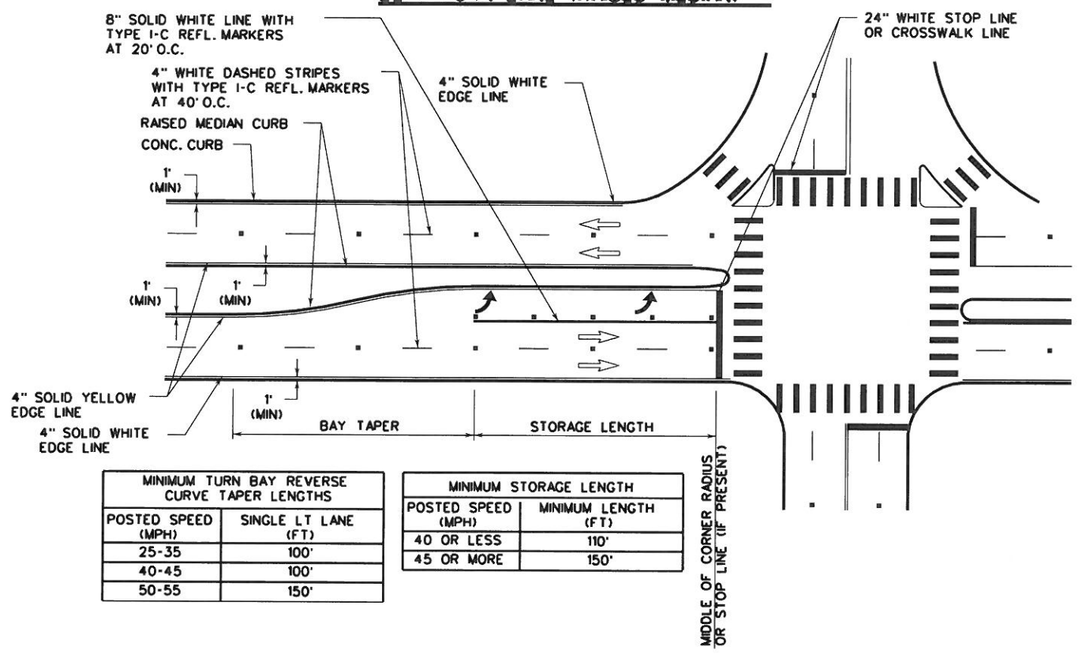

| MINIMUM TURN BAY REVERSE CURVE TAPER LENGTHS | |
|---|---|
| POSTED SPEED (MPH) | DUAL LT LANES (FT) |
| 25-35 | 150' |
| 40-45 | 150' |
| 50-55 | 250' |

| MINIMUM STORAGE LENGTH | |
|---|---|
| POSTED SPEED (MPH) | MINIMUM LENGTH (FT) |
| 40 OR LESS | 110' |
| 45 OR MORE | 150' |

NOTES:

1. THE POSTED SPEED LIMIT IS TYPICALLY EQUAL TO THE DESIGN SPEED MINUS 5 MPH.
2. THE DIMENSIONS GIVEN FOR DUAL LEFT (RAISED MEDIAN) IN THE MINIMUM LENGTH TABLES ON THIS SHEET ARE ALSO APPLICABLE FOR DUAL RIGHT-TURN LANES.
3. STORAGE LENGTHS LONGER THAN THE MINIMUMS LISTED ON THIS DRAWING MAY BE DETERMINED USING TRAFFIC ENGINEERING ANALYSIS OR APPROXIMATE CALCULATIONS.
4. FOR THE PLACEMENT OF PAVEMENT ARROWS AND WORDS SEE LEFT-TURN "ONLY" AND ARROW SPACING WORKSHEET.
5. REFER TO APPLICABLE STANDARD PAVEMENT MARKINGS WITH REFLECTIVE RAISED PAVEMENT MARKERS FOR POSITION GUIDANCE AND LEFT-TURN & RIGHT-TURN LANE STANDARD PAVEMENT MARKINGS WITH REFLECTIVE RAISED PAVEMENT MARKINGS.
6. REFER TO BICYCLE LANE PAVEMENT MARKINGS STANDARD FOR TYPE AND PLACEMENT.
7. 4" SOLID WHITE AND YELLOW EDGE LINES ARE OPTIONAL AS DIRECTED BY THE CITY TRAFFIC ENGINEER.

## LEFT-TURN LANE (RAISED MEDIAN)




| MINIMUM TURN BAY REVERSE CURVE TAPER LENGTHS | |
|---|---|
| POSTED SPEED (MPH) | SINGLE LT LANE (FT) |
| 25-35 | 100' |
| 40-45 | 100' |
| 50-55 | 150' |

| MINIMUM STORAGE LENGTH | |
|---|---|
| POSTED SPEED (MPH) | MINIMUM LENGTH (FT) |
| 40 OR LESS | 110' |
| 45 OR MORE | 150' |

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CITY OF SAN ANTONIO
DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS

# LEFT-TURN LANE & RIGHT-TURN LANE DESIGN WORKSHEET 1

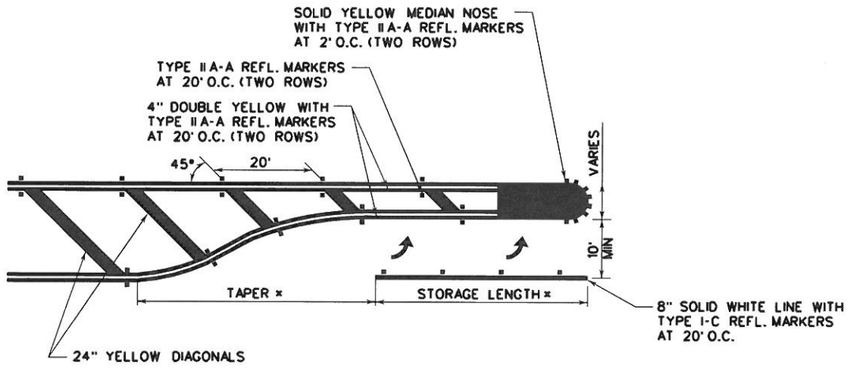
SHEET 10 OF 16

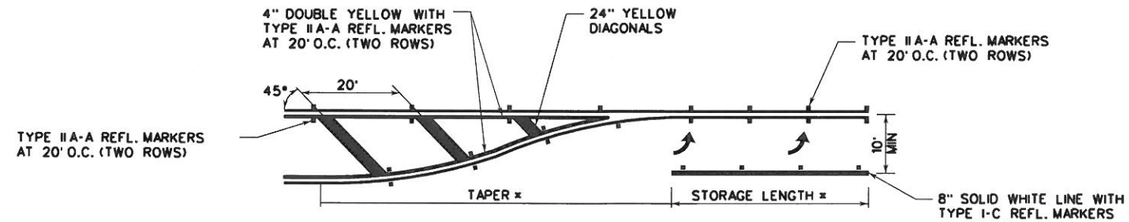
30

| % SUBMITTAL | PROJECT NO.: | | DATE: |
|---|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.R.V. | CHKD. BY: J.J.E. | SHEET NO.: OF |

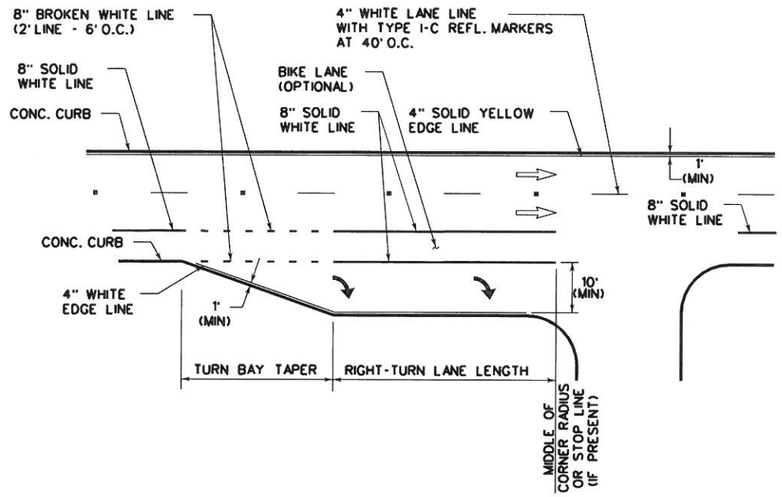
## PAINTED MEDIAN LEFT TURN BAY DETAILS

* - USE MINIMUM TURN BAY REVERSE CURVE TAPER LENGTH AND MINIMUM STORAGE LENGTH TABLES FOR "LEFT-TURN LANE (RAISED MEDIAN)" ON SHEET 10 OF 16.




## UNSIGNALIZED RIGHT-TURN LANE




| MINIMUM TURN BAY TAPER LENGTH | |
|---|---|
| POSTED SPEED (MPH) | LENGTH (FT) |
| 30 OR LESS | 90' |
| 35 OR MORE | 120' |

| MINIMUM RIGHT-TURN LANE LENGTH | |
|---|---|
| POSTED SPEED (MPH) | LENGTH (FT) |
| 40 OR LESS | 110' |
| 45 OR MORE | 150' |

NOTES:

1. THE POSTED SPEED LIMIT IS TYPICALLY EQUAL TO THE DESIGN SPEED MINUS 5 MPH.
2. THE DIMENSIONS GIVEN FOR DUAL LEFT (RAISED MEDIAN) IN THE MINIMUM LENGTH TABLES ON THIS SHEET ARE ALSO APPLICABLE FOR DUAL RIGHT-TURN LANES.
3. STORAGE LENGTHS LONGER THAN THE MINIMUMS LISTED ON THIS DRAWING MAY BE DETERMINED USING TRAFFIC ENGINEERING ANALYSIS OR APPROXIMATE CALCULATIONS.
4. FOR THE PLACEMENT OF PAVEMENT ARROWS AND WORDS SEE LEFT-TURN "ONLY" AND ARROW SPACING WORKSHEET.
5. REFER TO APPLICABLE STANDARD PAVEMENT MARKINGS WITH REFLECTIVE RAISED PAVEMENT MARKERS FOR POSITION GUIDANCE AND LEFT-TURN & RIGHT-TURN LANE STANDARD PAVEMENT MARKINGS WITH REFLECTIVE RAISED PAVEMENT MARKINGS.
6. REFER TO BICYCLE LANE PAVEMENT MARKINGS STANDARD FOR TYPE AND PLACEMENT.
7. 4" SOLID WHITE AND YELLOW EDGE LINES ARE OPTIONAL AS DIRECTED BY THE CITY TRAFFIC ENGINEER.

SEPTEMBER 2009

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DEPARTMENT OF PUBLIC WORKS

TRAFFIC ENGINEERING STANDARDS

LEFT-TURN LANE & RIGHT-TURN LANE DESIGN WORKSHEET 2

SHEET 11 OF 16

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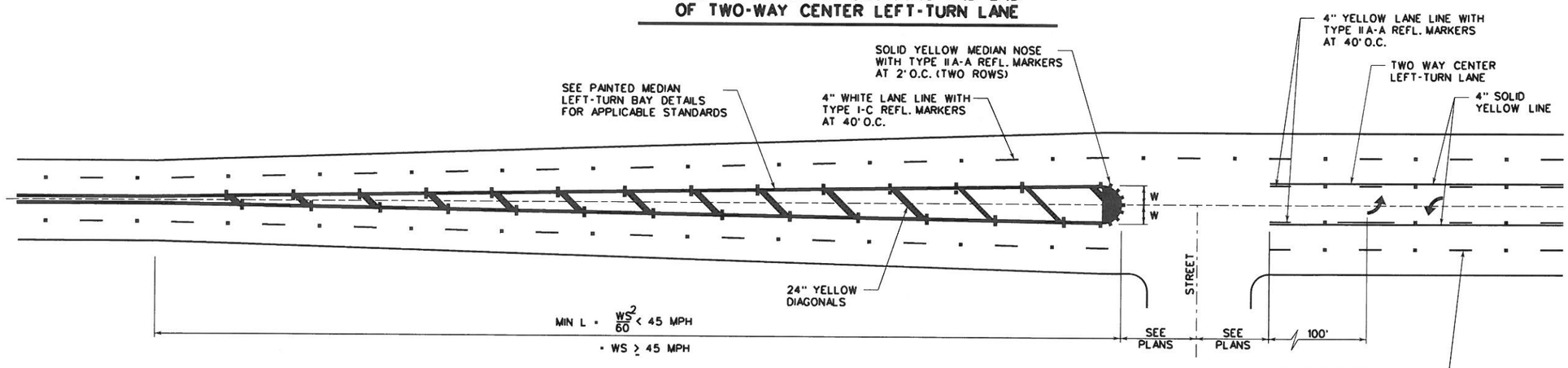
| % SUBMITTAL | PROJECT NO.: | DATE: |
|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.R.V. | CHKD. BY: M.E. | SHEET NO.: OF |

## TYPICAL TRANSITION AT BEGINNING AND END OF TWO-WAY CENTER LEFT-TURN LANE




W = WIDTH OF OFFSET (FT)
S = POSTED SPEED (MPH)
L = LENGTH OF CROSSHATCHING (FT)

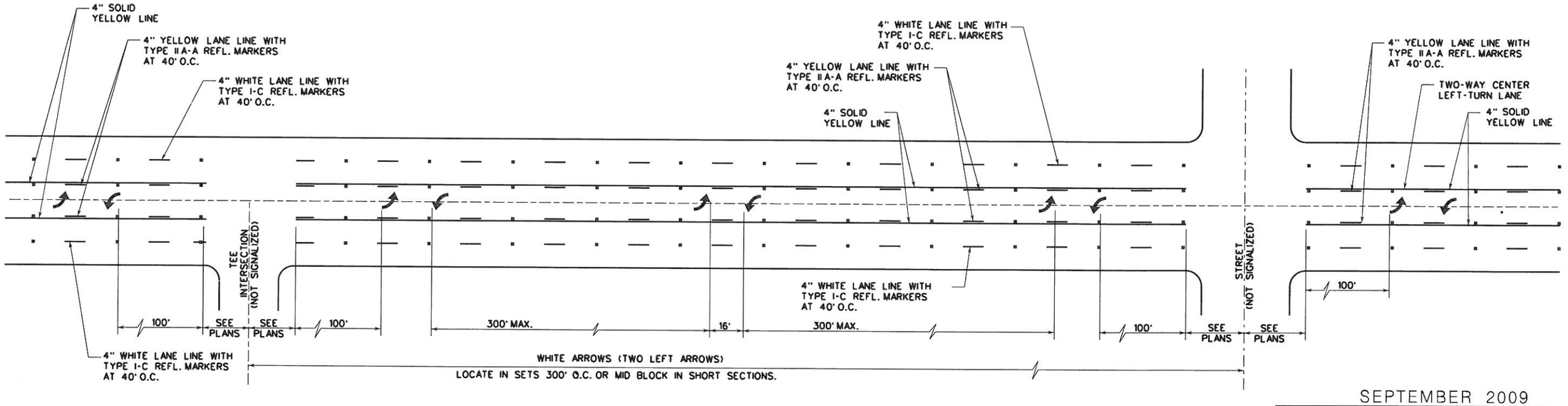

LEGEND
TYPICAL DETAIL

(PLACE LEGENDS IN ACCORDANCE TO LEFT TURN "ONLY" AND ARROW SPACING WORKSHEET)

NOTE:

1. REFLECTIVE RAISED PAVEMENT MARKERS SHOULD BE IN ACCORDANCE WITH STANDARD PAVEMENT MARKINGS WITH REFLECTIVE RAISED PAVEMENT MARKERS FOR POSITION GUIDANCE AND LEFT-TURN & RIGHT-TURN LANE STANDARD PAVEMENT MARKINGS WITH REFLECTIVE RAISED PAVEMENT MARKERS.
2. SEE LEFT-TURN & RIGHT-TURN LANE DESIGN WORKSHEET FOR APPLICABLE INFORMATION.
3. SEE LEFT-TURN "ONLY" AND ARROW SPACING WORKSHEET.

## TWO-WAY LEFT-TURN LANE DETAILS NON-SIGNALIZED INTERSECTIONS

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TRAFFIC ENGINEERING STANDARDS
TWO-WAY LEFT-TURN LANE DETAILS 1
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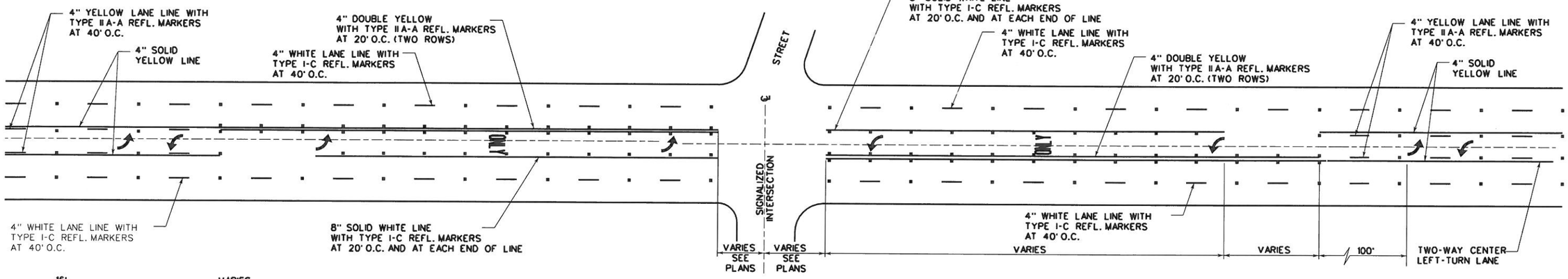
## TYPICAL TWO-WAY LEFT-TURN LANE DETAILS

SIGNALIZED INTERSECTION





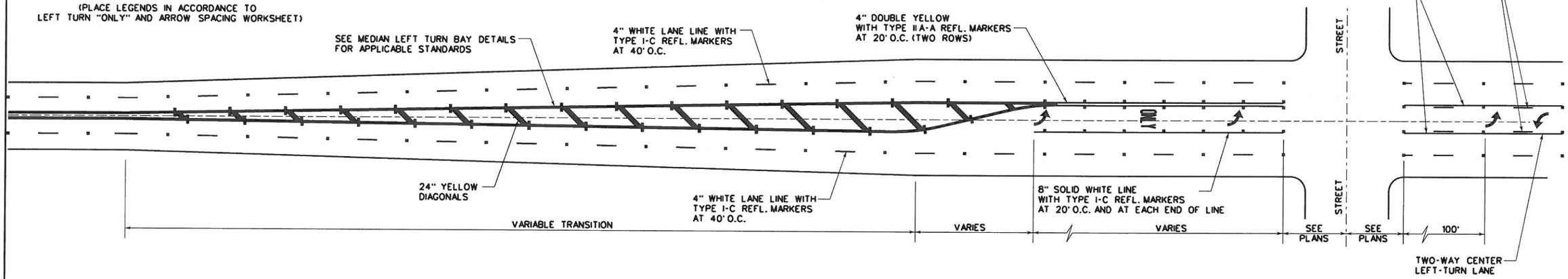
LEGEND

TYPICAL DETAIL

(PLACE LEGENDS IN ACCORDANCE TO LEFT TURN "ONLY" AND ARROW SPACING WORKSHEET)

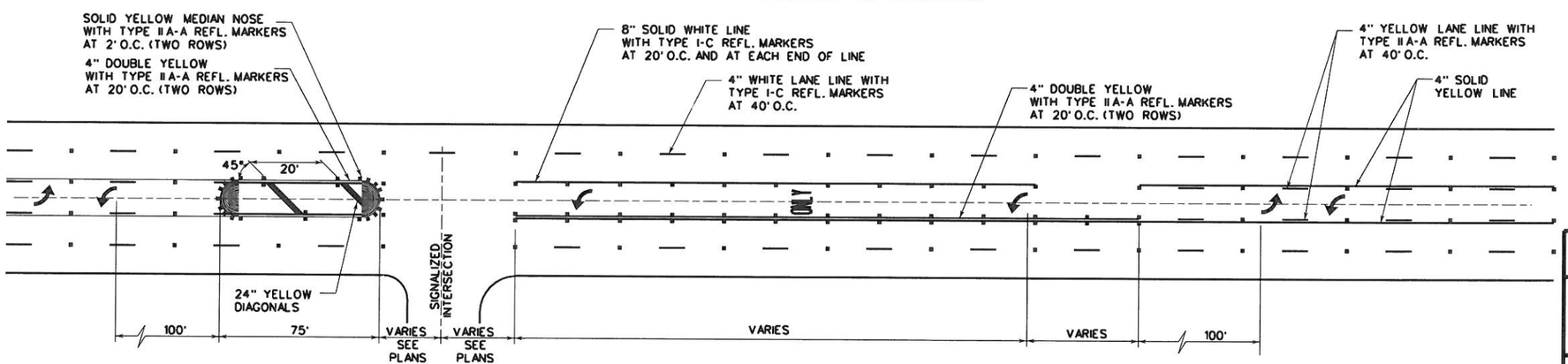
## TYPICAL MEDIAN LEFT TURN BAY

SIGNALIZED AND NON-SIGNALIZED CROSS STREETS AT BEGINNING AND END OF TWO-WAY CENTER LEFT-TURN LANE




## TYPICAL TWO-WAY LEFT-TURN LANE DETAILS

SIGNALIZED TEE INTERSECTION




NOTE:

1. REFLECTIVE RAISED PAVEMENT MARKERS SHOULD BE IN ACCORDANCE WITH STANDARD PAVEMENT MARKINGS WITH REFLECTIVE RAISED PAVEMENT MARKERS FOR POSITION GUIDANCE AND LEFT-TURN & RIGHT-TURN LANE STANDARD PAVEMENT MARKINGS WITH REFLECTIVE RAISED PAVEMENT MARKERS.
2. SEE LEFT-TURN & RIGHT-TURN LANE DESIGN WORKSHEET FOR APPLICABLE INFORMATION.
3. SEE LEFT-TURN "ONLY" AND ARROW SPACING WORKSHEET.

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TWO-WAY LEFT-TURN LANE DETAILS 2

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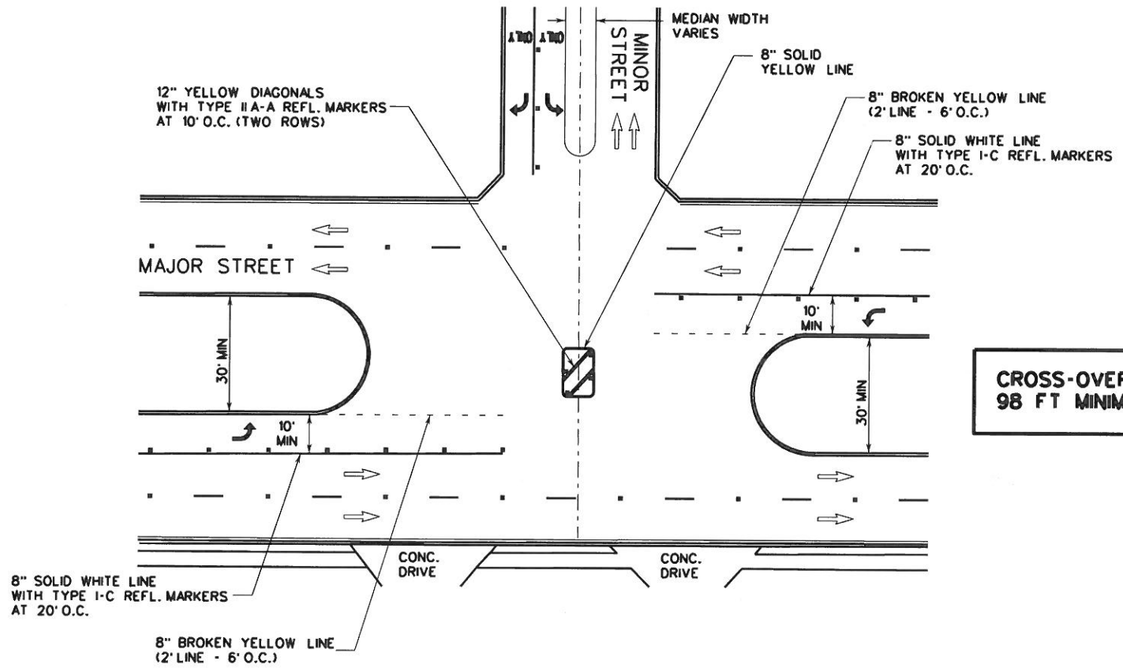
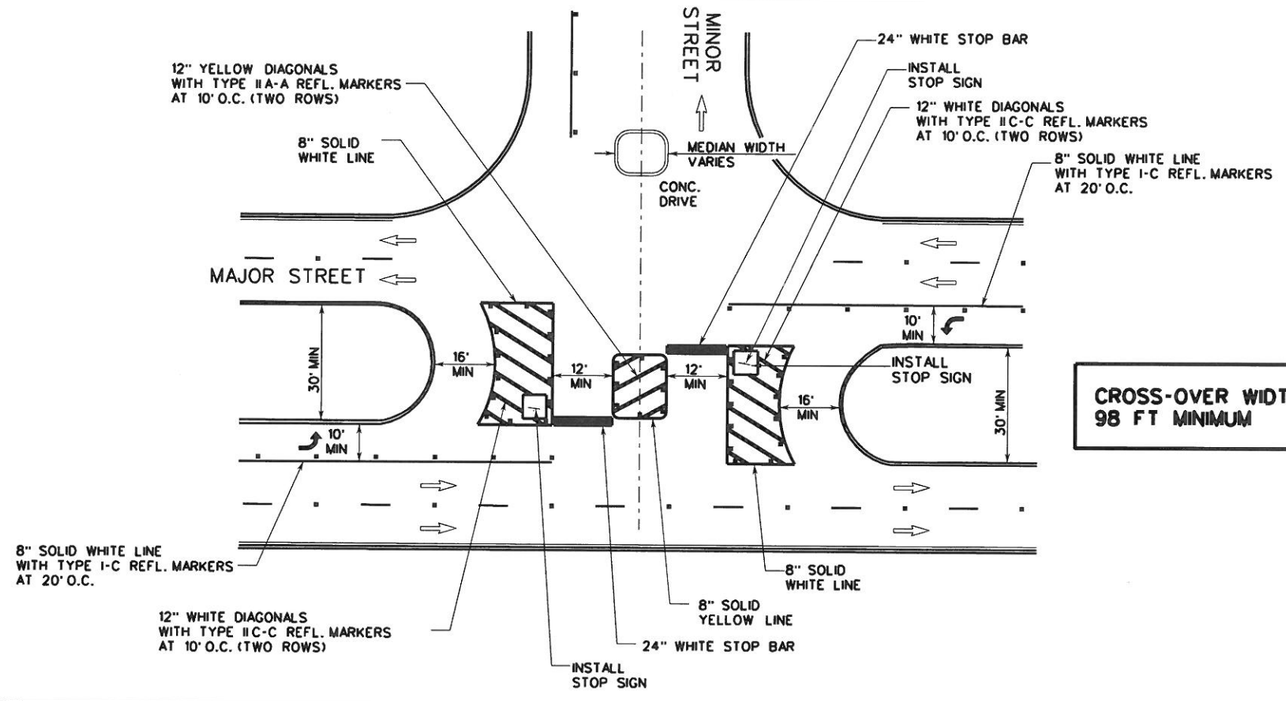
## CROSS-OVER MEDIAN OPENING WITHOUT TURN AROUND STRIPING "TEE" INTERSECTION




**CROSS-OVER WIDTH 98 FT MINIMUM**

## CROSS-OVER MEDIAN OPENING WITH TURN AROUND STRIPING "TEE" INTERSECTION




**CROSS-OVER WIDTH 98 FT MINIMUM**

NOTE:

1. REFER TO LEFT TURN "ONLY" AND ARROW SPACING WORKSHEET.
2. SEE MISC. CROSS-OVER DETAIL FOR APPLICABLE INFORMATION.
3. ALL MEDIANS SHALL BE FIELD MEASURED TO DETERMINE THE LOCATION OF NECESSARY STRIPING. STOP BARS AND CENTERLINES SHALL BE PLACED WHEN THE MEDIAN WIDTH IS GREATER THAN 30 FT.
4. THE MEDIAN WIDTH IS DEFINED AS THE AREA BETWEEN TWO ROADWAYS OF A DIVIDED HIGHWAY MEASURED FROM EDGE OF TRAVELED WAY TO EDGE OF TRAVELED WAY. THE MEDIAN EXCLUDES TURN LANES.
5. THE MEDIAN WIDTH MIGHT BE DIFFERENT BETWEEN INTERSECTIONS, INTERCHANGES AND OF OPPOSITE APPROACHES OF THE SAME INTERSECTION.
6. THE NARROW MEDIAN WIDTH WILL BE THE CONTROLLING WIDTH TO DETERMINE IF MARKINGS ARE REQUIRED.

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STANDARD CROSS-OVER MEDIAN OPENING 1
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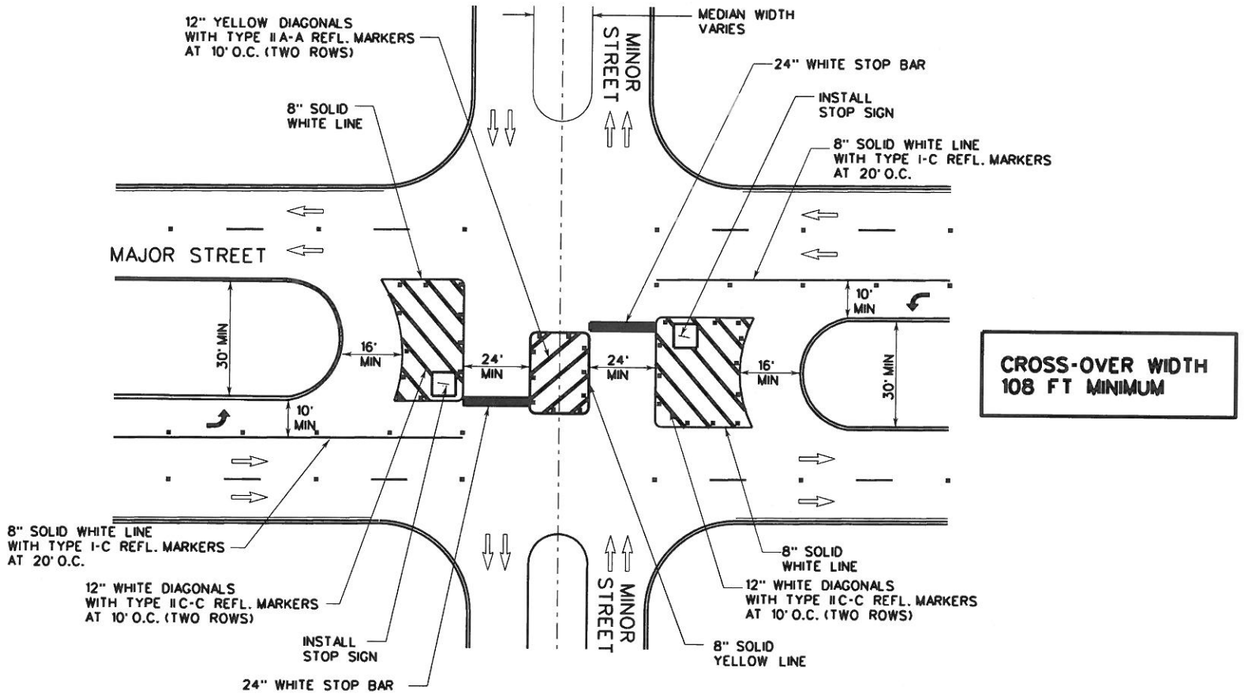
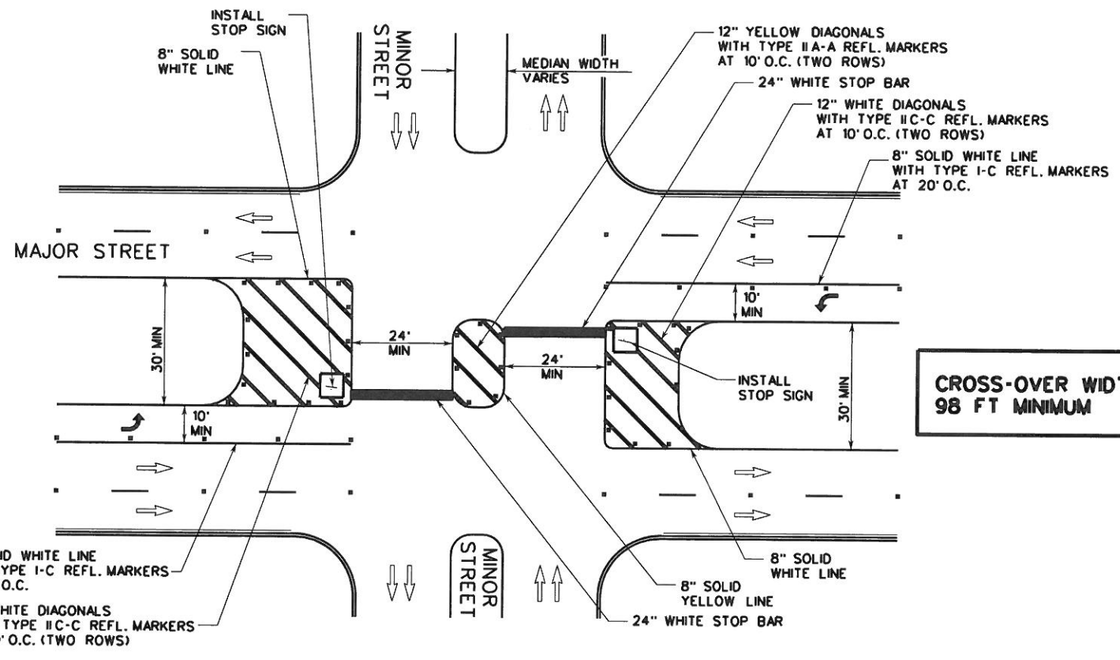
## CROSS-OVER MEDIAN OPENING WITH TURN AROUND STRIPING FOUR-WAY INTERSECTION




**CROSS-OVER WIDTH 108 FT MINIMUM**

## CROSS-OVER MEDIAN OPENING WITHOUT TURN AROUND STRIPING FOUR-WAY INTERSECTION




**CROSS-OVER WIDTH 98 FT MINIMUM**

NOTE:

1. REFER TO LEFT TURN "ONLY" AND ARROW SPACING WORKSHEET.
2. SEE MISC. CROSS-OVER DETAIL FOR APPLICABLE INFORMATION.
3. ALL MEDIANS SHALL BE FIELD MEASURED TO DETERMINE THE LOCATION OF NECESSARY STRIPING. STOP BARS AND CENTERLINES SHALL BE PLACED WHEN THE MEDIAN WIDTH IS GREATER THAN 30 FT.
4. THE MEDIAN WIDTH IS DEFINED AS THE AREA BETWEEN TWO ROADWAYS OF A DIVIDED HIGHWAY MEASURED FROM EDGE OF TRAVELED WAY TO EDGE OF TRAVELED WAY. THE MEDIAN EXCLUDES TURN LANES.
5. THE MEDIAN WIDTH MIGHT BE DIFFERENT BETWEEN INTERSECTIONS, INTERCHANGES AND OF OPPOSITE APPROACHES OF THE SAME INTERSECTION.
6. THE NARROW MEDIAN WIDTH WILL BE THE CONTROLLING WIDTH TO DETERMINE IF MARKINGS ARE REQUIRED.

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TRAFFIC ENGINEERING STANDARDS
STANDARD CROSS-OVER MEDIAN OPENING 2
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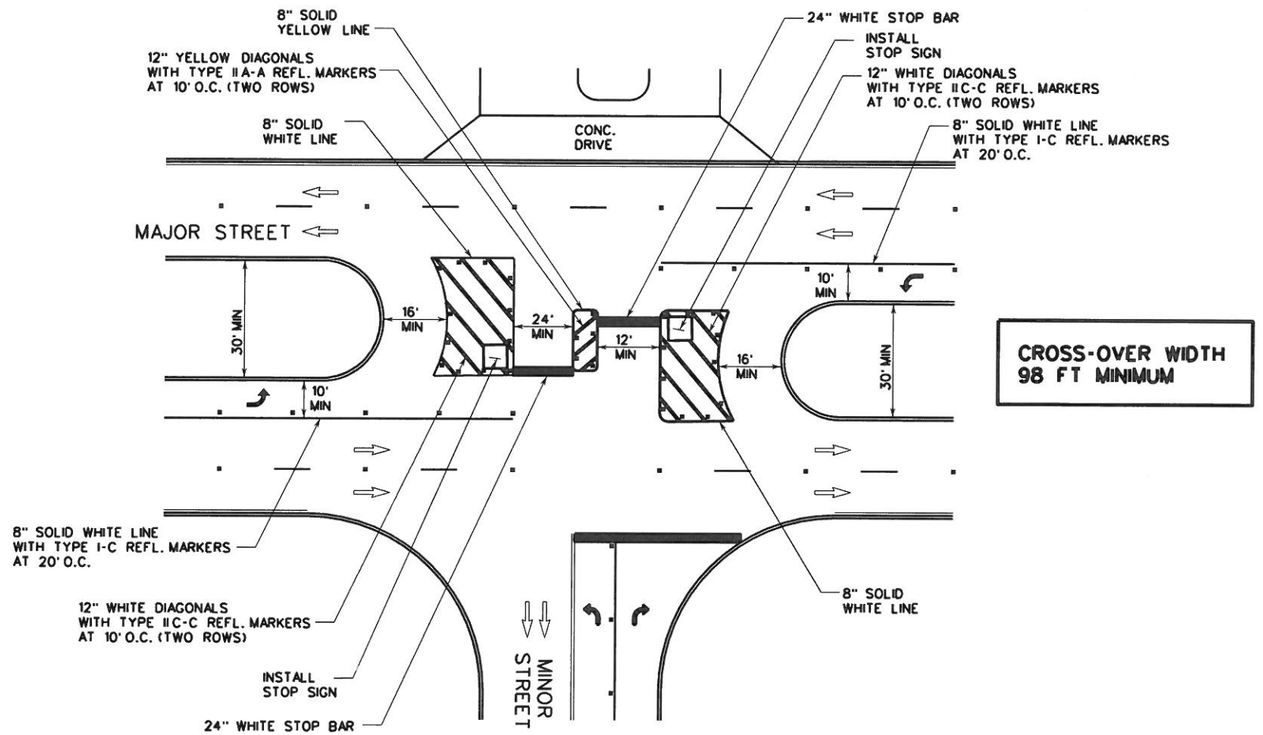
## CROSS-OVER MEDIAN OPENING WITH TURN AROUND STRIPING "TEE" INTERSECTION




**CROSS-OVER WIDTH 98 FT MINIMUM**

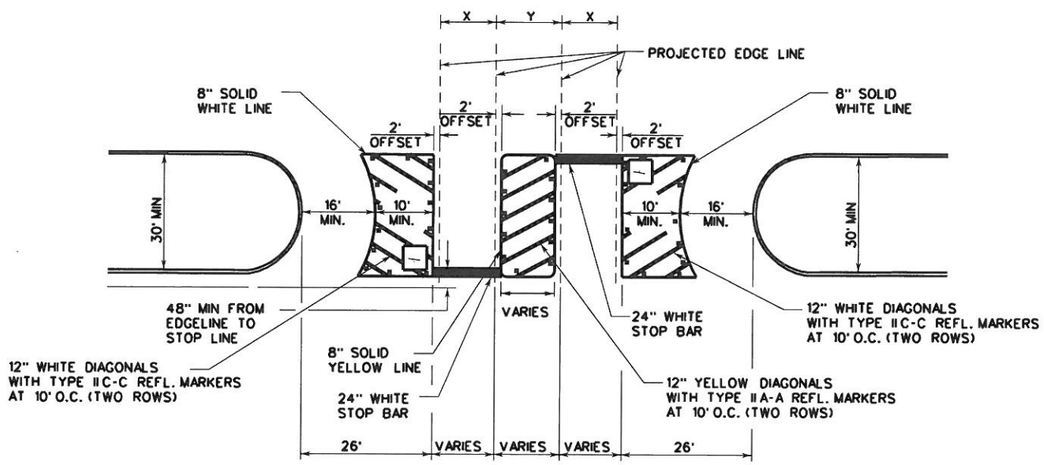
NOTE:

1. REFER TO LEFT TURN "ONLY" AND ARROW SPACING WORKSHEET.
2. SEE MISC. CROSS-OVER DETAIL FOR APPLICABLE INFORMATION.
3. ALL MEDIANS SHALL BE FIELD MEASURED TO DETERMINE THE LOCATION OF NECESSARY STRIPING. STOP BARS AND CENTERLINES SHALL BE PLACED WHEN THE MEDIAN WIDTH IS GREATER THAN 30 FT.
4. THE MEDIAN WIDTH IS DEFINED AS THE AREA BETWEEN TWO ROADWAYS OF A DIVIDED HIGHWAY MEASURED FROM EDGE OF TRAVELED WAY TO EDGE OF TRAVELED WAY. THE MEDIAN EXCLUDES TURN LANES.
5. THE MEDIAN WIDTH MIGHT BE DIFFERENT BETWEEN INTERSECTIONS, INTERCHANGES AND OF OPPOSITE APPROACHES OF THE SAME INTERSECTION.
6. THE NARROW MEDIAN WIDTH WILL BE THE CONTROLLING WIDTH TO DETERMINE IF MARKINGS ARE REQUIRED.

## MISCELLANEOUS CROSS-OVER DETAIL WITH TURN AROUND STRIPING

NOTE:

1. X - ROADWAY WIDTH AND NUMBER OF LANES VARIES
2. Y - MEDIAN WIDTH VARIES

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TRAFFIC ENGINEERING STANDARDS

STANDARD CROSS-OVER MEDIAN OPENING 3

SHEET 16 OF 16

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|---|---|---|
| DRWN. BY: LAN | DSGN. BY: C.B.V. | CHKD. BY: M.E. | SHEET NO.: OF |